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MORE POWER TO YOU!

*A Working Technique for Making
the Most of Human Energy*

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MORE POWER TO YOU!

A WORKING TECHNIQUE
FOR MAKING THE MOST
OF HUMAN ENERGY

BY

WALTER B. PITKIN



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TO
MY TWO OLDEST AND BEST FRIENDS,
LECITHIN
AND
CHOLESTEROL

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I am indebted to many investigators of human energies. The most useful studies include those of A. V. Hill, the distinguished English physiologist; Henry C. Sherman, who for years has done outstanding work at Columbia University in the field of the chemistry of food and nutrition; Max Rubner, the founder of "human energetics"; G. Lusk, our own most brilliant student of Rubner; the Benedicts, among the few whose accurate measurements of human metabolism put it on a new basis; the Taylor Society and many of its members, whose investigations of the techniques of economy in common work revolutionized industrial management. So far as I know, no one has made a more comprehensive study of the factors affecting energy and working ability of factory employees than Dr. Carey McCord and his assistants, of the Cincinnati Industrial Health Conservancy Laboratories. I have reported several of their most significant findings. Most of the practical rules of progressive relaxation derive from Professor Edmund Jacobson's long and careful studies of this technique.

Scores of investigators who have tried out various techniques of economizing energy on themselves and on fellow students might

Acknowledgments

well be mentioned here, if space permitted. Here scientists and laymen meet. In one group of seekers we find men as different as William James and Gamaliel Bradford, or as Irving Fisher and Donald Laird; and from each something serviceable has been gleaned. To all such fuller credit will later be given in a larger study of this same all-embracing problem of human welfare.

WALTER B. PITKIN

New York, June 1, 1933.

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“Vitality of any sort, even if expressed in fancy, can blunder through many a predicament in which reason would despair.”

GEORGE SANTAYANA.

INTRODUCTORY

I

Life Planning Calls for Energy Planning

As never before, thoughtful people recognize the need of planning their lives. But how few fully understand that this involves, as perhaps the first discipline, the skillful organizing of one's energies! Life is one long stream of activities, of work done, of energies transformed; whether it is anything more than such a flux may well be argued; but that it is at least this much cannot be doubted. A plan of life is therefore a plan of work. A plan of work is a plan of tapping energies, a plan of transferring energies from one place to another, and a plan of changing energies from one form to another for the sake of certain desired results.

What you would like to do for the rest of your life plainly depends, above all, on what energies you have in reserve, what you can add to these, and how well you can divert the fund to the ends you elect. A wish that lacks its enabling power is a pious wish and nothing more. An ambition deprived of drive is an idle dream.

The strain of adapting to today's chaotic environment imposes a special requirement on the ordinary man. Whether he plans his life

well or ill, the mere confusion of adjustment predisposes him to fatigue. And of all obstacles to the efficient use of energies by healthy people, fatigue is the greatest. If accompanied by ill health, it is devastating.

II

The Inner Conviction of Power

At the outset assume enthusiastically one simple proposition. *You can double your efficiency after a little training.* The odds are a hundred to one in favor of this being true. Don't assume this pleasant fact as a matter of autosuggestion *à la* the good old Dr. Coué. Assume it because many experts in self-discipline have proved it in themselves and in others. Do not think it a figment of your own imagination. Accept it before you begin these exercises, and it will almost certainly demonstrate itself before your own eyes within a month or two.

Have complete confidence in your ability to tap your energies more easily and to make them serve you better, even though at first you may find the discipline very hard. The fact that it is difficult to make progress at first means absolutely nothing unfavorable. Any scientific technique of remodelling a human being is bound to prove complicated and tedious, if not disheartening, at some stages. Expect this as the most natural thing in the world. Never expect to get everything for nothing!

There is a profound truth in Coué's remark that "it is not the person who acts; it is the method." He means, of course, that doing now this and then that in a certain manner and order gets results. It is not you who get them. Here lurks a genial exaggeration, let us admit. But the kernel of truth is unmistakable. Specific acts lead to specific results. Technique is the process of selecting and ordering such acts. Once you learn it, you may rest assured of the outcome, ninety-nine times out of a hundred.

You conserve enormous energies if you follow the simple rule of *never driving the engine when there is something wrong with it*. If your watch is out of order, you do not expect it to keep time—still less to improve by running on and on without an overhaul. If your automobile motor pounds and heats up, you do not pat it on the back and say to it: "Be brave, little one! Carry on! Courage will strengthen your moral fibre." But how many people believe man's inner energies and their mechanisms to possess the miraculous power of feeding on adversity, fattening on famine, and attaining merit in heaven through assiduous practice of their worst defects!

The highest performance any engine can deliver comes only when every part is perfectly fitted to every other, and all materials in the parts are suited exactly to the service de-

manded of them. This axiom of engineering is not accepted and practised by one man in ten thousand. That's why so few people use their power plants to full capacity.

III

The American Crisis

"What are the limits of human faculty in various directions?"

"By what diversity of means, in the differing types of human beings, may the faculties be stimulated to their best result?"

"These two questions dominate the whole problem of individual and national education. We need a topography of the limits of human power, similar to the chart which oculists use in the field of human vision. . . .

"The limits of power must be limits that have been realized in actual persons, and the various ways of unlocking the reservoirs of power must have been exemplified in individual lives. . . . So here is a program of concrete individual psychology. . . . It is replete with interesting facts, and points to practical issues superior in importance to anything we know."

I first heard these words from the lips of William James, as he delivered his famous address on "The Energies of Men" before the American Philosophical Association at Colum-

bia University, December 28, 1906. Though twenty-seven years have slipped away since that day, the thought then and there implanted has never withered in my memory nor lost its amazing fertility. A sorry comment it is upon the scientists who heard James then that not one of them was moved to launch inquiries that might answer one of the two central questions. True, here and there an isolated experimenter has brought to light certain important facts about human endurance, but the systematic attack upon the entire technique of energy still remains to be planned and carried out.

America was, I suspect, too deeply engrossed in the conquest of physical energies back in 1906. There were too many fascinating (and manifestly lucrative) discoveries to be made in physics, chemistry, engineering and business! The mastery of human nature seemed a remote, perhaps even academic problem to men who hunted gold mines, flung tracks across the continent, and tapped oceans of petroleum. But as time has passed, we have slowly come to understand that, now as always, man is the central issue of mankind. We have discovered also that, in our machine age, man is largely a creature of his job; his energies are molded to the demands of machines and office staffs and sales policies. Hence the highest social obligation of the psychologist would appear to be that of training men to manage their energies for the sake of managing themselves, first as

workers and then in a larger manner as citizens. The psychologist's contribution to the great problem of fitting mankind to its physical and personal energies has been tiny thus far; the full significance of James's advice seems to have gone lost.

Engineers have contributed ten thousand times more than psychologists to the great art of adjusting workers to jobs. So it will always be, too; for the psychologist undertakes to select and train men for specific tasks, in which certain processes and machines are accepted as factors of the problem, whereas the engineer, confronted with maladjusted toilers in a factory, attacks the problem by remodelling the equipment and methods so that they impose fewer and smaller strains upon human nature. Let us look at a few cases.

Here is a great steel plant. It has a rivetting department where the din of steam hammers and the compressed air rivet hammers shatter the nerves of workers with sensitive ears. The factory summons a psychologist to sort men for work in this inferno. The psychologist tests applicants to find the few who are not perturbed by the terrific metallic noises. He selects perhaps a few partially deaf people along with others of a peculiarly dull temperament; and his task is well done. The job has, as usual, determined the worker.

But the intelligent factory summons at the same time an engineer to work out methods

of softening the noises of rivetters. In time the engineer submits designs of mufflers, shock absorbers, and finally electric spot welders. These are tried out and eventually installed. Now the din is over forever. No longer need the vocational psychologist hunt for half-deaf workers and dull-spirited fellows. The engineer adjusts the job to the worker. And this is human progress.

Look again. Now we see a railway company hunting for locomotive engineers of the highest reliability. They must have exceedingly keen vision, to detect track signals on foggy nights; superior motor responses, so as to handle levers and valves at top speed in an emergency; steady nerves and ears that are not rasped by the screech and thunder of the equipage. The psychologist devises tests to pick such high-grade workers out from the throng of applicants. Meanwhile the engineer invents automatic safety controls which stop trains that overrun signals set against them; now it is of no particular importance that an engineer see through night murk, for his train is handled by mechanical aids. True, we should not care to have the company employ blind engineers. But the high selective value of superior eyesight has been lost.

Turn almost anywhere in modern industry and office management. Always the same spectacle confronts you. The imperfections of our instruments and methods give the voca-

tional psychologist a temporary task, whose importance we need not belittle. He must select men to fit the imperfect machines and methods as long as these survive; but the engineer tackles the larger and the forward-looking puzzle of transcending the flaws of equipment and thereby transforming jobs to suit men. So, you see, the psychologist is always engaged in finding and training men to get along with our imperfect industrial paraphernalia, while the engineer is ever seeking to abolish all hard, mean, degrading and otherwise undesirable jobs by finding better devices for doing the same work.

This is most unfortunate, from the psychologist's own personal point of view. But he can do nothing about it, for he happens to be working on assignments which are, in their very nature, minor and transient. Training for a specific job may prove valuable for less than a year. A new machine may come from some engineer's mind and in a twinkling make useless all of the earlier dexterities. Thus recently in the textile field: the standard machines for making underwear were, only two or three years ago, superseded by a new kind which requires less energy, less dexterity, and less intelligence on the part of the operator, while increasing the output by nearly one-half.

Most vocational education, as developed by psychologists in association with superintendents, is doomed to become a series of magnificent futilities, not through the failure of the

psychologists but rather as a result of technological progress, which is now causing, for instance, carpenters, masons, bricklayers, and house painters to become obsolete, while tomorrow's technique of factory-made dwellings brings in new occupations and minimal dexterities.

Is there any useful domain left open, then, for psychologists who take seriously the problem of human energies? Yes. Outside of narrowly technological jobs there spreads the larger and richer expanse of personal ambitions, creative effort, and sheer living. Strange as it may seem, only a small fraction of the ordinary man's energies can be used on his job nowadays; hence the science and techniques of energy suggested by James must arise around other issues and interests than those of vocational education. What are these other foci? A glance at the scene unfolded in 1933 reveals them clearly.

During the next ten years we Americans must learn new ways of work and living. At least 10,000,000 of us who have been lolling along in white-collar jobs must limber up the old biceps and get down to brawn (maybe at only a dollar a day and board). Fully 15,000,000 more of us lately in some field of skilled labor must seek new tasks demanding somewhat different dexterities. Maybe as many as 10,000,000 of us who have passed our forty-fifth year will have to drop out of the workaday world to make way for younger, more strenuous toilers. And an-

other 15,000,000 of us will be compelled by law to ease up, being delivered by Federal law from the forty-four- or forty-eight-hour working week; for, as these lines are being written, the National Industrial Recovery Administration is setting up shorter working hours than anybody would have dreamed of ten years ago.

What a confused situation! Millions being burdened more heavily, while other millions slacken their pace! Millions shifting to new jobs, while other millions are ousted from all jobs! Plainly no single patter of advice can be doled out to all of these people promiscuously. And yet, underneath all differences of fate, can we not see a general practical problem? *Must not all these millions reorganize their energies from the bottom up in order to succeed and be happy?* Must not the pattern of the day's work be redesigned? Must not those who have been polishing swivel chairs perfect their large muscles for heavy labor? Must not those who lose their jobs while they still bubble over with energy find some fresh outlets in hobbies or in sheer play? Must not those who shift from one skill to another transform their hands and fingers and eyes so as to fit the new jobs? Yes indeed! Every person caught in the stupendous social-economic revolution must face squarely the hard problem of tapping, controlling, and utilizing his personal energies. To solve it, in most cases, almost every

nerve and muscle must be reeducated. And it is best solved if the greatest possible economy of energy output, relative to accomplishment, is achieved. To get the most for the least is the first rule of intelligence.

Hence this little book. Hence, too, its peculiar design. It is not a treatise on health, yet it brings up the matter of health over and over again. It is not a discourse on diet, yet it recurs to food with monotonous persistence. It is not a sermon on physical culture, yet it covers many matters of muscular exercise and control. It is not a textbook on mental hygiene, yet it deals with a score of psychological phenomena which are often discussed by psychiatrists and psychoanalysts. It is not a book on morals, yet it encroaches strangely upon the prerogatives of the preacher. Why this queer cross-section of so many fields usually held apart? Simply because we are concerned with the Art of Work. In whatever form work is done there must be a technique of efficiency. There must be some method of making the least energy go furthest in digging a hole in the ground, and another method for the conducting of calculations in higher mathematics. In each case, again, there must be three grand divisions of technique, which we may call the technique of the power plant, the technique of the transmission lines, and the technique of the terminal workshop. All work involves power storage, suitable power

distribution, direct, well-insulated lines to the point where work is finally to be done; the best possible upkeep of the entire mechanism, and careful choice of work, which must be suited to the capacity of the equipment.

IV

Our Aim

This book has one clear aim, which is as bold as it is simple. It seeks to fill the widest, deepest void in American home training, in formal schoolroom education, and in moral technique. Its endeavor is to guide people, young and old, strong and weak, through the mazes of that as yet undiscovered Art from whose further bourne no traveller has returned with notes and tales of full enlightenment. This is, as you know, the Art of making the most of our energies. It is the Art of getting the most for the least. It is the Art of storing and spending what we take in from food, drink, air, and sunlight in such manner that we get what we want when and where we want it with the slightest possible wastage of nerve, muscle and blood.

No people on earth know much about this Art. Perhaps we Americans know less than some others, too. At any rate, more human energy goes to waste in our land than in any other. Every year, more suicides! Every year, more murders! Every year, more minds break down and must be packed off to asylums. Every year, more people with frazzled nerves seek

escape in narcotics, the consumption of which by Americans far exceeds that of any European country and equals some parts of Asia, on a *per capita* basis. Every year, more people above fifty years of age die of degenerative diseases, such as heart failure, cancer, nephritis, and bursting blood vessels. Every year, more neurotics, more neurasthenics, more chronic worriers!

Now, all these collapses are, at bottom, nothing more than profound defects in energizing—if we exclude the rare and obvious cases of pathological insanities like dementia præcox. Somewhere a stream of electrons went off on a tangent. Somewhere an insulation on a nerve tract wore thin or burned out. Somewhere a tiny amount of calcium taken in the food failed to pick up the requisite number of ions. Somewhere the transmission lines crossed or grounded. Today every scientist working in the fields of physiology, physiological chemistry, and medicine knows this and is seeking more precise methods of discerning and measuring energy streams of exceeding smallness. Not until they have succeeded with all streams will all the foundations of the great Art be laid.

Meanwhile, like all other domains of twilight, this field is the happy hunting ground of quacks, cultists, religious fakirs, and sincere but blundering amateurs. To drive out all of these is quite impossible today, for nobody possesses adequate ammunition in the form of

easily demonstrable facts. How far, for instance, can one's energy flow be controlled by what we call, most foggily, "the will"? The honest psychologist and physiologist must confess that no answer is at hand. At this point the quack whoops gleefully: "I told you so!"—and then proceeds to make all sorts of wild assertions about "tapping immense reservoirs of energy" by simple meditation, prayer, or the blank contemplation of his toes.

I have no interest in criticizing hypotheses nor in assailing cults. There is a more profitable task at hand. Let us gather all facts that have been well established. Let us shun guesses and wishes. Let us then organize everything definite about human energy so as to exhibit its practical bearings. To do this, we must seek for years through the files of scientific journals and must inquire of specialists in all lines of research touching the intake and output of energy. That done, we next turn to analyze all the commoner aims and labors of mankind. Here we inspect the energy requirements and the conditions of work. Job analysis, in short! Thus we move onward to the final and hardest enterprise, the relating of particular human energies to particular kinds of work and achievement.

Some day—perhaps a hundred years hence—somebody will make a complete survey along these lines and draw up a set of one or two thousand well-founded rules for storing, tapping, and economizing energy in all forms of

work. Today the best we can do is to take the first two or three steps toward that far, dim goal. These steps are not uncertain. They are not taken in the dark. They do not wander but move in a straight line. They tread no bog of metaphysic, no marsh of mysticism. Each least fact on which they are based has been verified over and over again in laboratories or under other suitable test conditions. Each may be found in some scientific journal, monograph or textbook. Matters of conjecture are always so annotated, but you will find very few in these pages. Our method tends to exclude them. For we reduce the elementals of the energizing technique to its simplest form as well as to its surest. To this end, the book includes two aspects. First, it sums up, in shortest possible phrase, the proved facts. And secondly, each section offers the practical rules.

We deliberately ignore certain important aspects of human nature; let no critic waste his ink condemning us for this, as the omission makes possible the whole treatment. We look upon man as the most amazing transformer of energy visible in our part of the starry universe. His abilities here transcend all others. So too does his lack of skill surpass his other shortcomings. He has never yet learned how to use more than one-seventh of his brain. He squanders half of all the potential with which he is born. Yet not out of any inner necessity! For it grows plainer every year that most waste of

energy arises from pure ignorance and faulty training.

Our schools might double the efficiency of our population and reduce to a vanishing point the unhappiness caused by lost motion, defeated plans, the feeling of inferiority that sprouts in the muck of bungling performance. This has not yet been attempted, though, because the ancient, musty, stupid notion of schooling and culture still rules—the notion that a man is educated when and only when he has amassed a million facts about language, grammar, history, rulers, novels, poems, geography, and so-called economics. The curse of the intellectual rests heavily upon the common man. In school he does not learn how to feed himself, how to work on a job, how to avoid exhaustion, how to walk, run, breathe, rest, play—in a word, how to do anything worth doing. He commits much to memory—never thereafter to use it. He reads much—but with dulled mind because the content has no bearing on the most important thing in all the world, the use of his own energies. From birth onward most of his time has been spent in doing something. Most of his thoughts turn around the prospective doing of something. Most of his reveries are memories of things done well or ill. How can we help him to make the most of life? Only by helping him do things. And how help him do things? First of all, by training him in all of the energizing arts.

V

Life and Energy

Living is a continuous change of energies. We take in certain forms of energy in our food, drink, and air. We make these over into new forms and store them in the liver, the blood, and various tissues. Whenever we do anything—be it dreaming or running a race—we tap these energies and change them all over again, first into new electrochemical patterns and then into motions of the body.

So, you see, all living combines at least four major techniques of energizing. They are:

1. Storing up energies for immediate and future consumption;
2. Tapping these, when needed;
3. Stopping energy flows, when necessary; and
4. Patterning many flows, both parallel and in series; that is, simultaneously and in well-timed sequences, for the execution of plans.

Here, then, are the topics of this book. You find each, first of all, stated as facts; then again, summarized in the form of useful rules. So far as space permits, each major rule is stated in a special form for people of different ages,

levels of culture, and types of ability. But no attempt could be made to adapt every rule to every type of reader.

Anybody under medical care must beware of our rules. They have been cast into a mold suited to healthy, close-to-average people. Hence they are also of little use to geniuses and giants. And they are mere rubbish for the man who is sincerely satisfied to drift aimlessly through life, having just enough to eat, attempting nothing beyond subsistence, and ending up like a gutted candle, all asputter and then a smoldering wick.

Among average healthy people, there is a large class at whom these pages are specially aimed. They are those who, through mere youthfulness or through inexperience, have never awakened to the tremendous fact that, from birth to death, each man jack of them must manage on a quota of energy as fixed as the courses of the stars. They have not yet discovered that life as a whole is not what it seems to Sweet Sixteen. As soon as they see the laws of energy, they profit thereby and reorganize their affairs. To all such, let the following summary of man's everlasting problem serve as a fillip of conscience!

BOOK I
POWER PLANT

I

Power and Energy

In our industrial age, power is the thing. Everywhere we read and hear about it and the measures men take to tap the world's available sources of it. More recently, innumerable discussions have swung to energy, as distinct from power.

Man began by harnessing animals to turn their energy to his use. He contrived machines to use the power of gravitation, levers, and elastic bodies. He harnessed wind, steam, and water. He has tapped the depths of volcanic regions. Many the contrivance invented to put at work the tides and waves of the sea. Man would pluck electricity from the very air over our heads; he would even concentrate sunlight and draw from it great power for the running of machines.

All this time there has been little talk of man power and man energy.

We use the former term, to be sure, but generally in the collective sense. We speak of a "nation's man power," or of an "army's man power." And as we attempt to heighten the efficiency of our workers, we still do not think of the

individual worker as primarily a store-house for power. We do not calculate his potentials as we do those of a stream or a dynamo. Nor do we begin to use his energies to the fullest. The most glorious machine the world has ever known, man suffers greatly from too casual treatment.

Fortunately, he possesses a neat mechanism of nerves and muscles that largely compensates of itself. Low or high in power, he generally adjusts himself to his environment and his stores of energy, all in a manner that goes for harmonious living. Yet even here, his power has never been truly reckoned. Man has too long been considered as a "spiritual" being, without taking into account the electrochemical determinants of his personality.

Power and energy must not be confused. Energy is the total working potential present in a given thing or person. Power is the work done under given conditions. Two engines using the same energy may differ enormously in power, for power is efficiency or end-result. So it is with plants and animals, including man. A person may have high energy and low power. Conversely, he may have low energy and high power. With inferior volume of available drive he may get much more done than another man whose energy is much greater. Observe, for example, a brilliant man, curious over the behavior of a chemical in his laboratory. He begins to experiment to discover what it is. He may work with it for

ten years, solve its nature, and prove only that it is a rather useless mess. During the years he has undoubtedly spilled energy about profusely. The power exerted is the "work done" in satisfying his curiosity and nothing more.

In all conditions of matter, the amount of work done varies more or less inversely to the rate at which it is done. The faster a machine works, the more energy is wasted and the smaller is the proportion of useful energy. The efficiency of a dynamo, for example, is greatest when the current is the least possible. An automobile driven at sixty miles an hour requires, relative to the number of miles covered, more gasoline than when driven at thirty miles. Broadly, too, this rule holds true for all human endeavor; and, thus, persons having little available energy tend—so far as they are well adjusted to their environment—to use it at relatively low rates. A person rich in energy may rush about at top speed, with absolute disregard of the consequences to himself and others. Even as he accomplishes more, he wastes still more.

In general, the wider differences in energy stored up, conserved, or poured out yield the greatest of all differences between man and man. They give us the chronic invalid and the piggishly healthy moron, the lunatic and the sane man, the unstable eccentric and the too stable dullwit. Ruling out the diseased and the insane, we may say that the practical consequences

of sheer energy are greater than those of any other single human quality.

If we could only tap all the energy in one pound of ordinary matter, such as dirt, ice, iron, coal, wood or anything else, we would develop 10,000 horse power for ninety long years. This is locked up in the atoms and still far beyond our reach. But every year brings us nearer to the goal. Children now living may reach it, and then a new world will be born.

Meanwhile who taps the energies of nature most efficiently? The ordinary citizen, not the engineer! The human nervous system is by all odds the finest tapping device known to science. But its excellence does not reside in volume production of power; it cannot draw forth from the atom any Niagara of kilowatts. Rather does it make a very little energy go a long way; and that little it extracts largely from atoms and molecules.

II

Time to Burn

You have reached the age of twenty, let us say, and weigh net 150 pounds. How much energy do you still have to burn up before your machinery gives out? About 52,840,800 calories, according to the closest calculations of the physiologists. How long will this amount last? All depends, of course, on the speed at which you burn it up.

What if you decide to exist as long as possible, and to this end you do absolutely nothing? What if you lie in bed as long as you can endure it, then rise and loll about all day, then off to bed again, never lifting a finger except when you have to? Well, with luck, you might hang on for 29,356 days, or about 80 years, four months and 24 days. That would bring you to the ripe age of a century.

What if you undertook to work hard every day, seven days a week, fifty-two weeks a year, without let-up, until you wore out? Then you would last only 48 years and 3 months. This assumes that the work you select burns you up at the rate of 3,000 calories a day—a fairly common rate in rather hard but not strenuous labor.

What if you decide to put in every day at running Marathon races and mountain climbing? Then your sojourn on earth is cut squarely in half again, for such grinding toil burns up 6,000 calories daily. You have only 24 years and some 45 days to go.

We know that nobody ever works or loafes on any such simple programs. We always knock off now and then. We always miss out days or weeks on account of sickness. We lose our jobs and hang around looking for new work. So our actual distribution of energy is irregular and spread quite unevenly over our days. But these over-schematic programs sharpen my point about energy; they show it is a quantity that is fixed according to your body weight, usable at many rates, and—once used—never to be recalled. For each pound of weight, an adult can burn about 252,242 calories sooner or later. This is more than three times as much as any horse or cow, any dog or cat has on reserve.

How slowly a man can consume himself has never been answered satisfactorily. To be sure, we know that, under ordinary conditions, the mere maintaining of bodily functions burns up about 1,800 calories every twenty-four hours. But may not new conditions be devised which reduce this considerably? Jacques Loeb, you may recall, lengthened the life span of some tiny creatures 1,000 times by slowing down their basal metabolism. Cold, a diet deficient in meat proteins, and various applications of drugs re-

tard the furnace. Many minor tricks of posture, breathing, and the like help a little, as we shall show elsewhere. That any immense retardation is possible without serious consequences seems most improbable, in the present state of science. But the possible retardations have not been well explored. So let us inquire into them.

We have seen the difference between energy and power, and we have also touched upon the part which the rate of energy consumption plays in determining the power factor. Let us look at this latter point now a little more closely.

III

The Rate of Living

What a man does, how much of it he does, how regularly or irregularly he does it, and how he reacts to it after the deed are all palpable indications of his deeper personality. Hence the importance of our understanding his rate of living and what determines it. Everyone who has watched people for many years will probably agree that the mere speed at which a man thinks, works, talks, plays, and—I am tempted to suggest—sleeps shows him up as clearly as any other single characteristic. So plainly is velocity a basic trait that psychologists have, in some cases unintentionally, used it as the measure of comparison in intelligence and efficiency tests. Most so-called intelligence tests turn out to be largely tests in quickness. But quickness is so closely bound up with effective thinking and dexterity that it easily passes for “brain power.”

All the things you do and the speed at which you do all you can in the course of your life reveal your total rate of living. This rate of living is the general working average of all a man's molecular processes, as they interlock in

his life pattern. It can be measured with much accuracy by the rate at which he burns himself up; and this rate includes all the special metabolic rates, such as digesting food, breathing, moving muscles, using sense organs, thinking, feeling, and so on.

The rate is measured either directly or indirectly. If directly, the person studied is put in an insulated box or room equipped with instruments which record the heat given off by his body by conduction, radiation, and evaporation. If indirectly, then the amount and character of the food he eats are measured and compared with his excreta. The chemist knows the heat liberated by each gram of food as it is oxidized; so that he merely has to discover the amount of food and the thoroughness of the oxidation.

Out of hundreds of investigations along these lines, the following facts are the most significant of those which have emerged:

1. Every person has his own basal metabolism, or natural rate of living. The average is about 25 calories per kilogram of body weight per day. But in the extensive array of individual cases studied by Benedict, we find some persons consuming as little as 18.1 calories while others run as high as 32.3. This means that the latter live nearly 80% faster than the former.

2. In general, a person of light weight has a faster metabolism rate than a person of heavy weight; and, of two persons having the

same weight, the taller shows a faster rate than the shorter.

3. The basal metabolism in any given person is extraordinarily stable. It shows the same high elasticity and low plasticity exhibited by protoplasm in general. When interfered with in any manner, the rate tends to return to normal with great violence.

4. In general, the rate of living can be slowed down somewhat more readily than it can be accelerated, without serious consequences. And, in lower organisms at least, if not in man, life can be greatly prolonged by such retardation.

5. The rate of living increases normally up to about the sixth year of life. Then it declines very slowly until around the twentieth year. Thenceforth it remains virtually constant, in the average, until the mid-thirties, and from then on it slows down steadily into old age. But this average tendency is not uniformly reflected in individuals; for here we find remarkable personal differences. The extremes show the maximum rate around the fourth year and a very high level between fifteen and twenty, while the minimum rate appears to reach its peak as late as the early thirties (though it is possible that such cases are pathological). Relatively slight variations, however, are the rule.

6. Of all the common internal influences which affect the metabolic rate, muscular effort speeds it up the most. The vegetative system uses

most of the energies which are generated, but it is so nicely regulated that changes in its condition do not alter the general rate of living nearly so much as the muscles do.

7. Emotional responses involving the endocrine glands influence the metabolic rate considerably, in the main through their enriching the blood.

8. The total energy which a person can generate and use during his entire life is fixed within very narrow limits. Thus the rate at which he consumes this energy determines his length of life more than any other factor in the total life pattern.

9. From birth to death, the amount of energy transformed is nearly constant in relation to protoplasmic weight, for all living creatures, when measured statistically. Individual differences here are slight as to absolute quantity; but, as we have seen, very small amounts of energy, if properly patterned, may result in stupendous differences as to final behavior.

10. The gross amount of energy developed in a given species or individual is determined almost entirely by the native characteristics of the specific protoplasms; but the speed and the manner in which that energy is used up is determined largely by all sorts of environmental influences, notably those which shape infancy habits.

11. The energy used by the central nervous system in making connections and build-

ing up integrative patterns is infinitesimal. A single nerve impulse causes an initial rise of about 10^7 degrees Centigrade, followed by a recovery phase in which nine times as much heat is given out as at first.*

* These eleven points have been drawn from sources too numerous to list here. They include such researches as F. G. Benedict's studies in the *Journal of Biological Chemistry*, Vol. 20, p. 263, and in the *Journal of the American Medical Association*, 1921, Vol. 77, p. 247; G. Lusk's essay on "Fundamental Ideas Regarding Basal Metabolism" in the same periodical and volume, p. 250; E. F. DuBois' "Clinical Calorimetry" in the *Archives of Internal Medicine*, 1916, Vol. 17, p. 915; Max Rubner's work, "Das Problem der Lebensdauer und seine Beziehung zu Wachstum und Ernährung," Munich, 1908; Raymond Pearl's "The Biology of Death," Philadelphia, 1923; A. W. Hewlett's "Pathological Physiology of Internal Diseases," Philadelphia, 1923; the studies of A. V. Hill, and many others.

IV

What Determines Your Energy: Accelerators and Retarders

The activities of electronic and molecular processes in the body vary considerably from person to person. In the determination of personality, these eleven facts express the individual's molecular activity. Let us group the determiners of personality under two heads, those which derive from native internal chemisms that are integral with the basal metabolism; and secondly, those which come from the physical and social environments.

I. Wholly or chiefly native determiners:

<i>Accelerators</i>	<i>Retarders</i>
Low body weight	High body weight
Great stature	Inferior stature
Certain superiorities in food assimilation	Certain inferiorities in food assimilation
High motor responses (rapid and frequent)	Low motor responses (slow and rare)
High fantasy	Low fantasy
Strong anger, fear, and curiosity	Weak anger, fear, and curiosity
Thyroids (normal)	Parathyroids (normal)
High sexuality	Low sexuality
Youth	Age

II. External determiners:

Accelerators

Fats and carbohydrates

Tonics, such as caffeine, theine, etc.

Heat

Sunlight (ultra-violet rays)

Muscular exertion

Aphrodisiacs

Herd life ("circular response," in which emotions and motor responses are intensified)

Retarders

Proteins

Depressants, such as alcohol, nicotine, acetanilid, etc.

Cold

Darkness (chiefly lack of ultra-violet rays)

Muscular inaction

Antaphrodisiacs

Solitude, with progressive introversions

Now, to what extent can you change these determiners? Except in disease, you must accept those which are native and adjust your environment and your mode of living to them so that they serve you as well as possible. Study your native characteristics carefully. Human beings vary enormously here. Some characteristics which speed you up may be offset by others which retard you. Thus, if you react swiftly with your muscles, but are well past middle age, your swift and frequent motor response is hampered by the lower basal metabolism of age. So you must adjust yourself accordingly. If, then, in your twenties you were a speedy and brilliant tennis player largely because your muscles reacted so rapidly

and frequently, at forty-five the latter may still move swiftly while your metabolism has dropped distinctly. It would, then, be dangerous, if not fatal, for you to play tennis as often and vigorously as you did when young. In fact, you might better give up the game entirely, and devote yourself to—say—billiards, which requires high motor response without taxing so heavily your lower rate of metabolism.

But it's another story with the external determiners. These you can shift and regulate at will. Their skillful manipulation, indeed, is the key to success in making the most of your energies. Learn to rule your surroundings so that they best serve your own nature.

During at least half of his waking hours, man's surroundings are determined by the work he does. And the job molds a man's outlook and attitudes more than any other single set of influences. As it also consumes more of his energies than anything else save the simple task of keeping alive, must we not agree at once that the worker who picks a vocation best suited to his natural energies will have the best chance of using the latter most economically, hence with the highest eventual satisfaction? This seems self-evident. If it is, then the first critical step in the art of tapping energies involves a choice of careers.

A man intent upon chopping down huge trees all his days has one set of energy problems. A man who dreams of designing calculating ma-

chines has quite another. Wisdom for the one is foolishness for the other. So, could we cover the whole subject of tapping energies here, we should have to consider jobs and their various requirements. Ten volumes, however, would have to be filled with this topic alone. So we must content ourselves with a few signposts that may mark the approaches.

What is the relation, if any, between the gross amount of energy you naturally discharge over long periods and the things you take an active interest in and pursue by preference? The first step toward such an answer is to ascertain how much energy is consumed in each of the many common activities, such as walking, talking, writing, lecturing, typewriting, singing, painting, dancing, and the like.

V

How Energy Determines the Job

While such measurements have seldom been perfected, we do have crude estimates based on what has been done by way of measuring the energy metabolism in artificially localized tracts of the body and in various occupations and activities. A few of these measurements have been made with great care and precision.

Study the following table, then, with care. Notice at once the astonishing fact that standing up not relaxed increases the consumption of energy about 15% above the amount used up when a man sits down. Walking slowly increases it 100%, while such activities as swimming, running, heavy exercise, and walking very fast increase it 500% and more. Can anyone reasonably doubt that, in man's free selection of occupations, sports, and ways of living, such differences count tremendously? Or that they may be the one decisive factor in men whose rate of storing up energy is subnormal?

Notice, too, the wide variations in energy needed in different occupations. A tailor uses up 135 calories an hour; but a carpenter uses more than once and a half again as much,

while a lumberman sawing wood and a swimmer consume more than three times as much.

ENERGY EXPENDITURE PER HOUR UNDER DIFFERENT CONDITIONS OF MUSCULAR ACTIVITY *

<i>Form of Activity</i>	<i>Calories per Hour per 70 Kilograms (154 pounds, weight of average adult male)</i>
Sleeping	65
Awake	77
Sitting at rest	100
Reading aloud	105
Standing relaxed	105
Hand sewing	111
Standing at attention	115
Knitting (23 stitches per minute on sweater)	116
Dressing and undressing	118
Singing	122
Tailoring	135
Typewriting rapidly	140
Ironing with 5-pound iron	144
Dishwashing (plates, bowls, cups and saucers)	144
Sweeping bare floor 38 strokes per minute	169
Book binding	170
"Light exercise"	170
Shoemaking	180
Walking slowly (2.6 miles per hour)	200
Carpentry, metal working	240
"Active exercise"	290
Walking moderately fast (3.75 miles per hour)	300

* Compiled by M. S. Rose, and reported by Henry C. Sherman, "Chemistry of Food and Nutrition," Table 23, page 195.

<i>Form of Activity</i>	<i>Calories per Hour per 70 Kilograms (154 pounds, weight of average adult male)</i>
Stone working	400
"Severe exercise"	450
Sawing wood	480
Swimming	500
Running (5.3 miles per hour)	570
"Very severe exercise"	600
Walking very fast (5.3 miles per hour)	650

The magnitude of these variations is surprising. They have tremendous significance in the processes of natural selection. I cannot resist the conclusion that at least the wider differences of energy consumption in occupations must be quite closely correlated with important differences in personality patterns. It stands to reason that a man whose body naturally generates a great quantity of energy will hardly remain long over a tailor's needle, while another man who manufactures barely enough to keep his body running will not fling himself blithely into the deep forest with an axe.

Nor, in all probability, does the correlation stop with such gross differences. Consider the cumulative effect on body and mind which ensues, on the one hand, when the body does not use up the energy it generates spontaneously and, on the other hand, when it is taxed beyond its normal capacities. Exceedingly slight divergencies in either direction must react upon the work-

er's attitudes, his interest in his work, his inclination to look about for another job, and his mistakes of craftsmanship.

It is almost certain that *the narrower the margin of energy, the more surely will the person select behavior which taxes him least and at the same time satisfies him best within the known range of low-powered activities.* The man of immense energies, be they vegetative, muscular, or mental, will spill them more or less carelessly; for it makes little difference to him whither they go. He always has more than enough power on tap for anything he may be moved to do. But the underpowered man, like the poor toiler, has to count his calories and dole them out with niggardly hand. Each one weighs heavily in the scales of his life. A little loss there, a slight overstrain here may upset his entire equilibrium. And for him an upset kills.

As a rule, people of high energy adjust themselves easily to all social relations where they must lead or manage other people. They get on well with their fellows, and can persuade, argue, debate, and generally do business with others. Those of low power are usually averse to selling goods, giving after-dinner talks, managing an office force, running a factory, engaging in politics, or doing anything else which throws them into frequent intimate contacts where they must manage others; but they have no trouble in dealing with animals or inanimate things. Do not misinterpret these facts to mean

that in casual social relations people of high energy "get along" better than those of low. Here we refer only to those activities involving in some sense the management of others. People with but a tiny trickle of energy, however, not only cannot even deal continuously and effectively with things, but they are forced to avoid the simplest social contacts, or be worn out by the strain on their frail motors. Hence they narrow their activities to "the life of the spirit."

Why? Because *dealing with other people consumes much more energy than dealing with things; and dealing with things consumes much more energy than dealing with thoughts.*

HIGH POWER JOBS

In the personal relations, two factors release large energy streams: first, the actual labor of dealing with people, and secondly, the spontaneous emotional reactions in the presence of people. Look, for instance, at such familiar lines of personal and social work as these:

Managing a family
Teaching school
Being a physician or nurse
Managing workmen
Selling goods by personal
solicitation
Being a court lawyer

Public lecturing
Acting

Compare the probable drain of energy in any of these with that of the tailor, the bookbinder, the metal worker, and carpenter, whose metabolisms were reported on page 44. While we have no laboratory records showing the energy expended by the mother of three children who must manage her own home and supervise her offspring, it is quite plain that, on the emotional side and on the work side of her life, she consumes the energy of many tailors. If it takes nine tailors to make a man, it must take forty to make a housewife. Domestic science experts have counted the steps she takes in her kitchen during the preparation of meals; their findings are not before me now, but the mileage is appalling. But even this is slight in comparison with the relentless spurts of emotional energy released in worrying over her children's food, their health, their getting to school on time, their dress, their naughtinesses; in anger at their misbehavior, at the way a neighbor's lad has smeared their pretty dresses with mud, at the windows they have smashed; and in pleasant excitement over their good marks at school, their winning a game of ball, and their neatness on Sunday. The wonder of it all is that more housewives do not collapse and end in asylums.

Similarly with other personal occupa-

tions. Each uses much energy in two ways, as contrasted with the one way of the ordinary man's labor over shoes, paint, lumber, stone, and other things. And these latter labors use much more power than any mental work does.

ALL THINKING USES LITTLE ENERGY

One of the best indirect proofs of the small amount of energy used in mental work is to be found in the extraordinary ease, smoothness, and absence of all fatigue in pursuing a line of thought in which one is deeply interested for hours, days, or even weeks, with few or no interruptions. Everybody who has had any extended experience in some field of intellectual effort is familiar with this agreeable phenomenon. I have witnessed it in scientists working over some abstruse problem, in authors fired by a powerful idea for a novel or play, and occasionally even in college students with a newly discovered love for a subject. In the few cases I have been able to watch at all closely, such persons seem to eat as usual or else markedly less than usual; they sleep as usual or less than usual, never longer; and they pursue their usual routine of muscular exercise. Nothing develops that remotely suggests exhaustion or even enhanced metabolism. To be sure, there may be eye strain or a stiff neck or weary fingers and cramped leg muscles, together with the minor discomfort that goes with sitting still too long.

But these may be discounted as accidents in the technique of work; and in some highly efficient intellectual workers they are never found.

Mental work warms us up only $\frac{1}{25}$ th as much as ordinary walking. The ingenious Benedicts, at the Nutrition Laboratory of the Carnegie Institution, have tested people in arithmetic while their bodies were in a state of complete relaxation; and they find that the energy in one-half of a salted peanut is enough to keep one going through a solid hour of the hardest sort of multiplying "in one's head."

This proves that the mere amount of energy is, for all practical purposes, negligible in mental work. But it throws no light on our problem of tapping energies for such tasks. What we wish to learn is: how do we release energy into the nerve tracts which must be used for mental work? For instance, is it more efficient to lie very quiet, as did the calculators on whom the Benedicts experimented; or would there be an advantage in sitting up, or in standing, or in walking about, or in reciting the problems and their solutions? Again: can we multiply numbers (or do any other specific task) more efficiently if we are alone, or if other people are present? Do we tap the elusive cerebral energies more quickly before or after meals? Do we work best in many short spurts or in long, steady pulls? Do we progress fastest if we work at top speed while under way or at a medium pace or at our slowest? Does the brain

serve us best on a mixed diet, or a meat-eggs-and-milk diet enormously rich in proteins, or on a vegetable diet? Is it better to sleep as long as possible at a stretch, or to sleep as little as possible at night and take a few naps through the day? Better to work outdoors or indoors? Better to work in summer or in winter? Questions like these must deeply concern everybody who has the slightest interest in making the most of himself in any field of achievement. To seek answers which may apply to people of various ages, native abilities, and backgrounds shall be our aim here.

VI

The Well-Balanced Diet

Your primary source of fuel is food. The kind and amount you take in profoundly affect your power plant.

You can literally double your physical endurance by proper choice of diet alone. Or you can double it by exercise alone. This has been demonstrated over and over during the past thirty or forty years, both in laboratories and in everyday life. If you are not interested in making the most of yourself, there is no reason why you should pay the slightest attention to the recommendations in the following pages. And I am not going to try to convert you to the cause of strenuosity. As a matter of fact, I think it lucky for the people who aim high that most people have no aim at all. The world might be in a mess even worse than its present one if all of us devoted ourselves to the task of becoming Franklin Roosevelts or Einsteins.

There's small danger of such a crisis in American affairs. For despite magnificent efforts to educate us in diet and health, most of us waste and deplete our energies every day through bad diet alone. Look at that largest group of our

working countrymen. Not less than 88% of industrial workers are hampered by improper diet. Such employees and their families in five large cities were recently studied by Dr. Carey McCord and his assistants.* They found that of all money spent by these families on food, 78% is misspent—either on improper or too costly or otherwise “uneconomic dietaries.” The average worker’s diet is somewhat better than his family’s, partly because he benefits from well-planned menus at the company cafeteria. Even so, his food habits as a whole are appalling. Not only is his diet bad in quality, but in quantity, too. Over- or under-weight by twenty pounds or more is common among industrial workers; and at least part of it is due to their eating too much or too little.

Even before the depression set in, malnutrition affected at least twenty per cent of the population. Likewise before 1929, fully four and a half million school children were ill fed. Today the situation is immeasurably worse—and to a certain extent needless. For the Department of Agriculture has worked out an adequate balanced diet for a family of five costing amazingly little. (Write the Bureau of Home Economics for details!)

The diet of many Americans is far too high in protein content—that is, in meat, poultry, eggs, fish, peas, beans, etc. Adults, as a rule,

* “Industrial Hygiene for Engineers and Managers,” Carey McCord. Harper and Brothers. 1931.

should consume not more than 10 to 15 calories in protein of every 100 in the entire diet. We commonly eat two or three times as much. Such a high protein content over-energizes you. It increases your rate of metabolism and sets up profound unbalance largely because your energy output is too low, relative to intake, unless your work requires hard physical exercise. As you store up protein reserves, you become sluggish and gain weight.

Why recite all these sorry facts? To point out how important it is for you to refrain from the diet mistakes of most of your fellow citizens.

If proper food were made accessible to us at all times, every healthy human could trust his vital impulses to eat what he likes. The condition is, of course, contrary to fact. But see how it works out with other animals.

Every creature needs its own kind of balanced ration. It must have certain foodstuffs in some proportion: carbohydrates, proteins, fats, vitamins, water, and what not. Securing these regularly, it thrives. Lacking any one for long, it languishes or even dies. Now, in a state of nature, most animals seem to encounter difficulties now and then in finding enough of one ingredient; and they are forced to substitute another. They take "something else just as good" which really isn't just as good. The wild hog is usually a skin-and-bones affair chiefly because of such a shortage. Beside him the domestic hog,

well housed and fed copiously at regular intervals, is a shining success. Even more so is the fancy bred hog which receives a ration that has been computed to the last ounce by dieticians.

But now for a surprise. The fancy bred hog who has his food balanced for him scientifically does not thrive so well as the hog who has set before him in separate dishes all the needed components of a square meal. This was prettily proved by John M. Evvard, of the Iowa Experiment Station, first in 1910 and since then by thousands of hog farmers, who have saved themselves millions of dollars by using Evvard's cafeteria method. The hog that is free to eat just what he wants when he wants it grows faster and is healthier than any other. This same method has since been applied with equal success to other lines of animal feeding.

I cite the hog chiefly because we agree that he seldom exercises his consciousness much in matters of diet. When he steps up to his cafeteria and devours tankage, we may be sure he does this under some simple alimentary urge, not as the result of brooding over the relative values of carbohydrates and proteins. Now, the significant fact to note is that, over weeks and months, the animal adjusts his intake to a nicety by the internal mechanisms of balance which we can observe in his impulses toward this or that trough of food.

These impulses, so far as they can be analyzed, arise in local tensions just as the general

reactions of hunger follow definite tensions in the muscles at the upper end of the stomach. Inasmuch as they "follow through" with astonishing accuracy, we can draw but one conclusion. The tensions causing the impulses must themselves be caused by the specific shortages of food stuffs in the body tissues. The instant enough of one kind of food has been eaten to wipe out that shortage, the animal "loses interest" in that food.

Children automatically select their articles of diet with somewhat the same precision as that shown by the hog, provided they are supplied with the correct ingredients properly separated and available at all times. The difficulties in self-feeding mostly reside in the methods of supply, not in the children. Food is badly prepared, wrongly mixed, or not made continuously accessible. Or, worse yet, bad food is made available along with good food. Whenever the conditions of the Evvard test are fulfilled, the human being behaves quite as intelligently as the hog.

Every move, then, made by humans to achieve these conditions is a step toward the proper regulation of energy intake. One of the most hopeful advances today is the steady outflow of disgusted city dwellers to small towns and farms. Here they can grow their own vegetables and some fruits, constantly available in wide variety for family consumption. Chickens, a cow, a vegetable garden and a few fruit trees

for every American family might produce a race of super-men!

Lacking such luxuries, how be sure your diet is adequate?

Sometimes only by experimenting. Many victims of true malnutrition are unaware of the specific unbalance. They feel depressed, and attribute their woes to creditors, family, or boss, when perhaps they suffer from Vitamin A deficiency. Or they feel fatigued, indifferent, and listless, due perhaps to nothing but improper food.

Strange as it seems, loss of appetite often accompanies malnutrition. The body in need of food loses interest in it. Then it swings into a vicious circle indeed! If your appetite is poor and you do not feel the need of medical attention because of serious upset, check up on your intake of Vitamin B. One of the most characteristic effects of a shortage here is the failure of appetite. The deficiency is supplied through more whole grains, milk, eggs, fruits, and vegetables. Artificially refined foods, if taken in too large quantities, often lead to Vitamin B deficiency, too.

A well-balanced diet should include milk, if you tolerate it, fruit, and green leaf vegetables in liberal quantities. Milk supplies Vitamins A, C, G, and calcium. Fruits and vegetables are good sources of at least two of these four requirements. (Here we must add a footnote: Experts differ on almost all phases of human

diet requirements. Changes and new discoveries occur daily. Today's meat may be tomorrow's poison. Take no diet dictums too literally. Be sure your food is varied, and that you eat the right quantity. Be guided by your weight, which should be stable, and your feeling of health. Don't be a diet faddist.)

Vitamin and mineral content are the first diet essentials.

The important Vitamins A, C, and G are high in the following foods:

Vitamin A Raw and canned spinach
 Carrots and carrot tops
 Escarole
 Tomatoes
 Peppers
 String beans
 Green peas
 Pumpkin
 Yellow sweet potato
 Butter
 Cream
 Eggs

A shortage of this vitamin, which can be stored up in the body, leads to a general weakened condition and low resistance to infections, as well as to other more or less serious upsets.

Vitamin C Oranges and other citrus fruits
 Tomatoes
 Cabbages
 Lettuce

According to Sherman,* the daily amount of Vitamin C necessary to prevent scurvy, which results from its deficiency, is about the amount found in an ounce of orange or grapefruit (raw or canned) or lemon juice or canned tomato or raw cabbage or onion, or in about a pound of cooked cabbage or potato, or in a pint of milk. For a good, not minimum, Vitamin C supply, drink a pint of orange juice with the juice of one lemon, and eat between a quarter to half a head of lettuce or its equivalent in raw cabbage every day.

Vitamin G Milk

Cream and ice cream

Dried yeast

Beef and veal liver and kidney

Lettuce

Turnips and turnip tops

Deficiency here leads to something akin to pellagra or premature senility.

Opinions about Vitamin D are controversial. It is available in egg yolk, whole milk, and butter fat. Whether it should be supplied in cod liver oil is open to question. Its equivalent is formed by exposure to sunlight at 30 or 35 degrees above the horizon. Found in ultra-violet rays, it is received in large amounts in direct sunshine under clear weather conditions in high altitudes, or at the seashore, or in the snowfields of high mountains when the sun is well up.

* "The Chemistry of Food and Nutrition." Henry C. Sherman.

(Don't be surprised to find some of these statements refuted.)

Next, see that your diet contains enough calcium.

Calcium makes "pep." Where get your calcium? From milk, best of all. It contains about 25 times as much as beef steak or white bread, pound for pound. This explains why so many dieticians prescribe some kind of a milk diet for so many varieties of ill health.

Many readers will complain, at this point, that they dislike milk and cannot bring themselves to drink much. Very well then! Disguise it in the form of cheese, or better yet in your favorite cooked form, such as custard or soup thinned with much milk (say an oyster stew or clam chowder or a purée of peas or a potato soup). Mary Rose, in "Feeding the Family," shows many ways of disguising milk in palatable dishes.

Here are some other foods high in calcium. See that your diet contains one or more of them with fair regularity. First of all, cheese. This much maligned food has come in for more than its share of criticism. Many believe that it causes constipation. As a matter of fact, its nutrition value is among the highest of all foods. It is not only high in calcium, but in phosphorus and Vitamin A content as well. Next, eat almonds, dried beans, egg yolk, all containing much calcium. Include, for variety, oatmeal, rice, carrots, peanuts, and walnuts. These foods do

not, of course, exhaust the list of calcium providers. For a more detailed discussion of this as well as every other phase of diet and nutrition, read Henry C. Sherman's excellent study, "The Chemistry of Food and Nutrition," from which many of my own points are drawn.

Why emphasize the importance of calcium so much? First, because the American diet is probably more deficient here than in any other chemical element thus far studied. An investigation of the diets of two hundred families revealed that on an average they showed a margin above absolute requirement of 140% in protein, 80% in phosphorus, but only 60% in calcium. Secondly, calcium corrects upsets in the inorganic equilibrium. Don't worry about taking too much. No serious disturbance results from liberal calcium consumption by healthy people. A shortage, however, of either calcium or phosphorus may lead to grave consequences.

For adequate phosphorus in your diet, eat some of these foods regularly: cheese, egg yolk, dried beans, whole wheat, peanuts, oatmeal, walnuts, carrots, milk. Phosphorus is found, too, in potatoes, especially near the skin, and in seafood.

Caffeine, in fully eight out of ten people, not only releases energy for all varieties of work but improves the organizing of energy. Unlike most stimulants, it produces no subsequent depression nor decline of working ability. In some individuals—like myself, for instance—the good

effect is noticeable within five minutes; but in most, it does not develop until after fifteen minutes or half an hour. Large doses, in excess of four grains, commonly bring on light tremors; but these wear off soon. Both the speed and accuracy of such complex tasks as typewriting are improved by drinking coffee that has been properly brewed. The improvement persists many hours; in some people as long as eight or nine. If my own experiences may be taken as a guide, the higher mental functions, such as imagination, memory, and reflective analysis, pick up their stride most briskly under the light lash of the drug. I have often measured my performance here and find it always varying directly with coffee consumption, up to certain obvious limits. Up to eight cups a day—three for breakfast, three for lunch, and two at tea time—"head work" ran on faster and more smoothly; but beyond eight cups no gain occurred, rather a marked loss of efficiency.

Two warnings! Individuals differ enormously here, and so do brands of coffee (no less than the cooks who prepare each brand). I suspect that most people who declare themselves harmed by coffee have not done as I have: they have not experimented with all brands on the market and with all methods of preparing coffee. Strange as it may seem, I find not more than two standard brands which I can drink without serious upset; yet other people cannot endure the brands I prefer. Again, as any coffee expert will

tell you, not one housewife in a score knows how to prepare the drink. Some of the poorest coffee poured down the human throat is obtainable at expensive New York hotels, while the finest ever is to be had for five cents at some of the chain restaurants in that same city. If you wish to use coffee in tapping your energies, go about it intelligently. Try all brands and brews out on yourself, taking nobody's word for any one. Try coffee at breakfast alone; then at midday alone; then at night alone. Try the one-cup dose, the two-cup dose, and so on. Try coffee apart from all food; then with food. Try it black, then with cream. Try it with sugar and without. If no combination or method helps you, then you are one of those unusual people who are built on a pattern different from the run of mankind.

One of the chief functions of drinking water is to flush poisons from the system. The water simply serves as a vehicle in many cases. If there is not enough of it, some of the poisons linger behind and cause upsets. Sooner or later these upsets interfere with the proper flow of energy, and then trouble begins. Here is a striking illustration.

Gilbert J. Rich has found that good-natured people pass more urine per day than ill-natured people; that good leaders surpass poor leaders in this same respect; and that stolid men likewise surpass excitable men.* This

* See *The Journal of Abnormal and Social Psychology*. Vol. 23, No. 2, p. 158.

squares with the well-established fact about the depressive insanities, one of whose regular symptoms is a greatly diminished urinary secretion. It is also what any physiologist would expect; for active kidneys scour the body of poisons and so go far toward holding it at a high level of vitality, which is always accompanied by a feeling of health and most often by a general good nature.

This suggests that people who display ill temper or sullenness while at work ought to try the effects of copious drinking of water, in any desired form. It would be too much to say that this alone would suffice to improve the emotions and attitudes; but it would be an easy, safe and fair experiment.

Alcohol seems to stimulate. But it merely breaks down the higher controls in the brain, thereby letting energy "run wild." The heightened activity of the slightly intoxicated person is nothing more than uncontrolled activity. It is like the rattle of an alarm clock whose main-spring ratchet is lifted out of gear, releasing the spring quickly. Slightly alcoholized people do not generate more energy; nor do they escape fatigue. Their energy merely runs to waste faster than when they are sober.

Their *feelings* of heightened activity are, of course, correct. But it is a mistake to infer that they are lifted to a higher level of organization or action. They sink to a lower pattern of energy. Work is done, but it is crude work.

America's best known beer consumer, the distinguished Dr. Mencken, issues excellent advice. Says he :

"Never drink beer, or any other alcoholic drink, while any work is to be done. It slows down the revolutions of the psyche. This is what it is for. Save it until evening, when you want to relax and forget your troubles.

"Never drink beer without eating something with it. The naked stomach wall sucks up alcohol too fast, and the slow, creeping, consoling effect is spoiled. Don't try to get it down too fast. . . . The most reliable virtuosi recommend a tempo of one liter an hour. Let it be that or less. After a couple of hours take a walk around the block, then you will be ready again."

Admirable wisdom! But how hard for the jazz-paced young American to follow! To loiter a full hour over a liter of suds is to take the 3.2% alcohol into your system only a trifle faster than if you were to spend the same time stuffing yourself on freshly baked bread.

Must you prepare for hard work requiring sheer strength or agility or speed? Then take considerable malt sugar, for it is turned into blood sugar faster than any other edible and cheap carbohydrate.

Tests made by Donald A. Laird, of Colgate University, support this practical advice. He fed his willing victims plain milk, milk with maltose in it, and milk with sucrose; then he put them all to work and measured their results.

The workers who drank plain milk fell

off in steadiness of hand to a mere 46.3% of their normal when fresh. Those who drank milk with sucrose, a "lefthanded sugar," fell off to 53.9%. But those who imbibed milk with malt sugar, a dextrose, were 74.6% as steady of hand at the end of the gruelling.

So too with dexterity and speed of performance. While the plain milk drinkers and the milk-and-levulose drinkers fell off in these abilities, the malt sugar men actually improved, so that, at the finish, they rated 104.5% of their showing at the start.

How does this happen? Ask a chemist. He will tell you that in the stomach malt sugar breaks down into two molecules, both dextrose, or righthanded sugars; but sucrose breaks down into one righthanded and one lefthanded molecule. The righthanded molecules pass fastest into the blood and become glycogen, or blood sugar. And there you are!

Many people (but not all) can tap their muscular energies better by adding considerable phosphate to their diet, beginning at least twenty-four hours before the start of heavy labor. The classical demonstration of this is Embden's tests on soldiers, in 1921. He fed them, along with their usual diet, 7.5 grams a day, using dibasic sodium phosphate ($\text{Na H}_2\text{PO}_4$) mixed with 95 parts of water and 4 parts of sugar. He checked up on soldiers put to work for one hour in a treadmill, then later on many more while out on

forced marches. And always the same result stood out sharply.

On days when phosphate was in their systems, they exerted themselves to a degree much greater than on other days. The tapping of energy usually began about six hours after taking the phosphate. It reached its peak on the next day. On forced marches the soldiers receiving phosphate were fresher than the others at all times. They were more alert when at rest. But the most striking effect, says Embden, was psychic. Soldiers deprived of phosphate were "dumb from fatigue at the day's end, while the phosphate-fed shouted and sang gaily." Some men had difficulty in sleeping. They were overstimulated. But this was not general.

Later studies by other physiologists suggest that the effect of phosphate is cumulative. Many small gains in muscular activity from day to day result in a distinct step-up of power flow. There is, however, no tremendous improvement; and one reason may be that the normal human body contains plenty of reserve phosphates in the bones. The supply cannot be tapped quickly; hence the phosphate treatment serves only to get the worker under way on a hard job and, above all, to remove the mental effects of fatigue. Dibasic sodium phosphate can be almost immediately used by the muscles.

Here, then, is the practical bearing of the matter. To get the best possible start in work

requiring muscular exertion in excess of what you are accustomed to perform, you will probably do well to try out the phosphate diet. Be sure to start at least one full day before the strain begins. Keep up the diet as long as it seems to serve its purpose. But do not expect to notice a greatly prolonged advantage.

Tremendous differences in the time required for tapping energies by various chemicals have been observed. A cup of coffee may speed you up in a few minutes. Phosphates start working only after six hours. Injections of cortico-adrenal extract pick up very slowly and do not reach their maximum effects until after nine or ten days, as a rule. But perhaps the best illustration free from technicalities appears in a well-calculated change of diet in a person suffering from some complex malnutrition. Here the first few days may develop no perceptible results. At the end of a fortnight a turn for the better is marked. But several months may pass before the patient feels ready for strenuous work and can undertake such without harm.

It is almost certain that some changes in bodily energy involve so many stages that a year or longer is required for their consummation. Remember that all such events are chemical; and that the velocity of chemisms is still one of the darkest corridors in all the halls of science.

VII

The Problem of Exercise Is Personal

The question as to how much exercise and what kind one needs is peculiarly personal. Its answer varies greatly with one's age and type of work, especially. Some people need much exercise, others none at all. Many of the world's most strenuous workers have never taken any, while others have testified to a doubling of their powers through physical culture. On no subject are loose generalizations more dangerous.

It is undoubtedly true that many people can greatly increase their powers through exercise. But nobody has yet been able to define the class of such people. Common sense would suggest that robust persons engaged in sedentary work ought to seek considerable exercise, not so much for the purpose of doubling their powers as for preventing a serious unbalance and consequent breakdown. Frail people, on the other hand, probably should not exercise much no matter what their type of work may happen to be. To have suggested calisthenics to William James or Gamaliel Bradford would have been ludicrous, and if anybody had attempted to drag me out on a golf course or into a gymnasium since

my thirtieth birthday, only disaster would have resulted.

So here, as elsewhere, we leave the problem for you to solve. But not without a word of warning. Never exert yourself to your maximum efforts. This is not only dangerous, but sometimes fatal. Secondly, when exercising, keep moving at an even pace throughout the exercise. Don't speed up and slow down at intervals throughout a single stretch. Not only do you waste your energies thus, but you put needless stress and strain on muscles adjusted to rhythmic, steady motion.

VIII

Start at the Bottom: Your Feet

Let's start at the bottom. How about those feet of yours? Is there not something ludicrous about the discovery, made long ago by physicians, that tens of thousands of lives are dwarfed and twisted by nothing more than bad shoes and bad erect posture? Some years ago I spent much time studying a variety of problems in connection with women's and girls' shoes; and I was dumbfounded at the ignorance and stupidity both in the makers and in the wearers. For a while I thought that the female of the species labored under some special blight. But later my attention was called to the amazing record of the U. S. Army recruits.

Soldiers, of course, must be well shod; for they live on foot and carry burdens of considerable weight. But in what condition do they join the Army? Look at a sample summary. Out of 30,000 men inspected in one district, only 18,000 had good feet. All of the other 12,000 had defects ranging from mere corns and bunions up to deformations of the bones. Out of the same 30,000 only 5,400 had shoes of the correct size and shape. Nearly 7,000 were wear-

ing shoes half a size too small. More than 14,000 were wearing shoes a full size or more too small. And some 3,500 were wearing oversize shoes. Nearly 6,000 suffered from flat foot in a form serious enough to interfere with successful work.

On a still grander scale this picture has been drawn by the Surgeon General's Office, in its famous report on "Defects Found in Drafted Men." Every hospital and most clinics handling nervous breakdowns repeats the scene. More than half of all headaches and indigestions from which women suffer are either caused by or greatly aggravated by bad shoes. I have even heard fairly conservative physicians say that a considerable number of neurasthenias can be traced to the same source.

IX

Temperature, Humidity and Work

The energies of men wax and wane with temperature, both inner and outer. Most ordinary work is performed best when the temperature is about 68° F., the air 50% humid, with a circulation of about 45 cubic feet of fresh air per minute maintained around the worker's body. Let the work be somewhat more arduous than average, and the worker's efficiency declines sharply with each increase of temperature and humidity. Peak performance at 85° F. is found to be about 37% poorer than at 75°.

The best temperature and humidity conditions for factory workers have been studied by Carey P. McCord. Here are the findings:

<i>Temperature in F.</i>	<i>Relative Humidity (%)</i>	<i>Capacity for work</i>
70°	40	Greatest comfort
	85	Comfort when inactive.
	91	Depressing fatigue
80°	20	No discomfort
	65	Discomfort
	80	Rest necessary
	100	Hard work impossible

<i>Temperature in F</i>	<i>Relative Humidity (%)</i>	<i>Capacity for Work</i>
90°	25	No discomfort
	50	No work should be done
	65	Hard work impossible
	81	Body temperature rises
	90	Dangerous to health

In mental work so little energy is converted that the need of radiating heat through the skin is slight; hence we perform almost as well in stagnant air at 85° as in fresh air at 60°. Some people, indeed, of whom I am one, seem to work at intellectual tasks more successfully when the thermometer registers in the eighties. A considerable rise in humidity is also generally tolerated with little drop in efficiency, provided the thinker does not walk about or otherwise use his large muscles much. Be guided here by the foregoing table, though don't take it too literally in applying it to mental work.

May not our energies change with that primary source of all heat, light and power, the sun? A few students have lately pointed out curious correlations between changes in solar heat and changes in world business. L. V. Burton, for instance, has exhibited before the New York Electrical Society charts showing the ups and downs in sun and in industry. During the last twelve years, each drop in the sun's heat output coincided with a period of prosperity, while each rise coincided with a period of depression. Solar

radiation, as shown by the records of the Smithsonian Institution, was well above normal throughout the depression of 1920-21 as well as in 1924 and 1927, both bad years for business! Likewise during 1932 and 1933! This may be a mere chance harmony, but it is worth watching. One theory advanced to explain it as a true cause is that an abundance of ultra-violet rays makes men optimistic, while a shortage depresses us all.

Be this as it may, we can assert with confidence that the average man thrives better under bright sunlight than in shadow and gloom. If each single person so thrives, why not suppose that the cumulative effect of sunlight on two billion people is powerful as a social and economic force?

THE WELL-WARMED BRAIN

My own experiences persuade me that we need a thorough inquiry into the effects of general body temperature upon the tapping of the higher mental energies. There is, so far as I can discover, no research in this field. Yet all that has been proved about the familiar correlation between temperature and chemical velocities should encourage such studies.

All my life I have been much more alert in moderately hot weather than in either cool or cold. At the same time I have reduced my gross muscular activity, as nearly all people tend to do in midsummer. Many years ago I also dis-

covered, largely by chance, that cold showers in the morning bath seriously lowered my mental activity for several hours of the forenoon. I gave them up and was immediately rewarded. My next experiment was with end-of-the-day baths. I used to finish off with a cold shower; but I tried dispensing with it and was more than pleased to find myself fresher through the evening and more fully relaxed for later sleeping.

In the course of these simple investigations, I checked up on the best seasons of study, writing, and serious reading. It turned out that exceedingly hot weather was a poor time for such activities, but fairly hot weather was the best of all; that is to say, days ranging between 80 and 90 degrees Fahrenheit. If, however, I had to exert myself physically on such days, the spell was broken; my head work deteriorated greatly then. The ideal formula seems to run about as follows: keep as quiet as possible; eat more salty foods than the dieticians authorize; get very thirsty as a result; then drink vast quantities of plain water, coffee, and milk; under no conditions lie down, even for ten seconds, during the work day; stand on my feet or else walk about the room gently, whenever the first sign of a tension or boredom or mental stalemate develops; and, above all, shift often from topic to topic, or else from one aspect of a subject to some other.

Would I recommend this procedure to all the world? Rather not! It happens to fit my own particular temperature-velocity pattern. It

may not fit ten other people in North America. But this need not turn us from the immediate issue: the unmistakable connection here between temperature, internal and external, and alertness suggests that most people have some optimum heat condition favoring the freest release of mental energies.

A warm body results from fast burning, of course. So do fast nerve currents. These run along, in ordinary temperatures, at about 406 feet per second; but if you chill them away down to the point at which they almost cease to function, and then measure their velocity as you warm them up again slowly, you find that the currents *double their speed with each rise of 10 degrees Centigrade*.

So, you see, that a rise of only one degree speeds the currents up about 10%, while a rise of only one-tenth of a degree speeds them up about 1%. Does this seem trifling to you? Well, it is not. Bear in mind several facts. First of all, healthy people may run as much as 15% above or 10% below the average body heat; so here, you see, is a possible variation of 25% from average, which is by no means inconsiderable. It indicates a parallel difference in the velocities of nerve currents, though of course the absolute speed of the latter remains to be calculated. Probably other factors influence the speed variously in different people; but we have no reason to believe that the general relation between temperature and speed is greatly modified by any such. So we are not far

from the truth if we conjecture that an extreme difference of 100 feet per second in nerve current speeds may occur between the coldest, most sluggish healthy person and the warmest, swiftest one.

Now, in the simplest muscular reflexes, this would not make any measurable practical difference in behavior, would it? So far as you could detect anything with the naked eye, the slowest man would sneeze about as fast as the swiftest. But the picture changes when you turn to the most complex acts of reflecting over some problem. And it changes for the simple reason that here the thinker must, so to speak, traverse thousands of feet of nerve tracts before he finds, at the heart of the labyrinth, the solution of the problem. Take this literally. His central nervous system contains billions of cells, each with ramifying fibres many feet long; and other billions of cells with much shorter fibres. To work out a simple task in arithmetic, such as dividing 5,677 by 13, he may have to send currents scooting up and down several thousand feet of nerve fibre. To make up his mind whether he ought to pay his rent or pack up and move before the landlord sees his furniture coming down stairs, our hero may have to excite a mile of nerve. The greater his indecision, the more likely that he excites a longer tract before reaching the right adjustment. So, in easy problems, the fast man may reach his solution only a fraction of a second ahead of the slow: but in very hard tasks he may

beat the slow one by five, ten, or twenty seconds *for each distinct mental operation.*

Now consider a prolonged task in which there are an even thousand such operations, all hard. A fair illustration here would be learning the elements of some foreign language or a branch of mathematics or the history of a strange country or the principles of a business or trade. At every moment throughout the entire learning process the hot, fast person gains on the slow, cold one. He finishes 100 steps in the mastery of his subject while the slow one is covering 75. But even this difference does not reveal the larger superiority of the fast one. For the field of associations widens with each step in learning. We always learn more that the item we strive to master. We tie it up with sundry other facts and principles as we advance. Though we may aim in one dimension, we achieve in many. A wave of mental stimuli runs out in all the space-time dimensions as we move onward in any given dimension. This, as I see it, is the exact equivalent of electromagnetic and radio processes; a current moving in one direction sets up a field all around it transverse to the line of motion. The faster the nerve current moves, the wider its transverse spread; hence the richer its associative field and hence the net final "experience mass." Mass is always a function of velocity.

Stimulation of brain centers by radio currents taken from high-frequency vacuum tubes speeds up mental processes. Recent experi-

ments in Germany, reported by O. H. Caldwell before the American Electrochemical Society at the May 1933 meeting, show striking improvements in both the speed and accuracy of thinking under such influences. Caldwell stated that the practical bearings of this phenomenon are not yet clear, but he made the interesting conjecture that "perhaps in the future the electric heating of men's brains may make us like gods."

I think we need not launch off into any such dizzy speculation. It is quite enough to know that, just as the body as a whole is accurately brought to any desired degree of fever by radioactivity today, under the amazing new techniques perfected in the past two or three years, so the central nervous system must likewise respond. Faster metabolism means faster neural reactions, of course; and faster reactions, under proper controls, can scarcely fail to improve mental behavior.

X

The Rhythms of Energy

Work always assumes some wave form. The particular form depends upon the kind of work no less than upon the personal peculiarities of the worker. Just as on the surface of the wind-swept ocean there are usually many systems of waves, ranging from fresh ripples to the long, deep billows surviving from a week-old storm, so in common toil: there are tiny pulsations in the individual muscle fibres, then a rising and falling in muscle masses such as those of the hands or the legs; then a general pick-up, peak, and waning of the body effort as a whole. One frequent wave form of the latter appears in factory jobs, where the worker advances through the day in periods of fifteen or twenty minutes each. At the trough of such working waves there should be—and often is—a rest. Then ensues a slow acceleration and warming up which bring the worker back to a new peak of output for ten or twelve minutes, at the end of which fatigue of a sort sets in, efforts weaken and slow down, and at length a new trough is reached.

Over and above these relatively fast,

brief waves there runs a long, low billow effect whose sweep has lately been studied by Rexford B. Hersey, of the University of Pennsylvania.

BILLOWS

Working for nearly a year with employees of a large organization, Hersey studied the emotional ups and downs of seventeen normal men and women. He kept records of both their objective and their emotional behavior while on the job. He studied each worker's efficiency, his energy feeling, illness, absence from and lateness to work, accidents, pleasant or unpleasant verbal outbursts, and constructive ideas. Then he noted emotional attitudes as revealed by feelings of general hopefulness, contentment, indifference, tensions, irritations, worry, disgust, pessimism, anger, sadness, apprehension, suspicion and the like. Thirdly, he reported their dominating thoughts and reveries. And finally he studied aches and pains, blood pressure, weight, sleep and fatigue.

From these reports he was able to graph the emotional cycles of each worker's life. These he found highly individual. Every subject showed consistent periods of "ups and downs." And certain general tendencies came out. During the "high periods" the workers did their jobs with ease and uncomplainingly. However, they sometimes fell short of peak efficiency because they were too easily interested by external

stimuli. They would often stop their own work to supervise that of their neighbors. In general they adapted with ease to daily demands. They slept less than in the "low periods," yet did not feel tired. And they were much more active socially.

In the "low periods" they tended to do less work than usual unless driven. Often this low performance was compensated for by the fact that they stuck to their jobs better. They took French leave whenever they dared or had money enough, and they often had apparently unavoidable accidents, even though accidents are usually due to carelessness.

Hersey found that the emotional cycle did not correspond to any other familiar one, such as work, menstruation, and the like. This agrees with my own observations. The time between up and down may be almost anything from six or seven weeks up to as many months; whether it is fairly constant in a given person, however, I do not know. Hersey suspects that it is, though he did not keep records long enough to establish his conjecture.

With some people, the swing is so long and so slow that it is seldom noticed; hence it is not reckoned with in planning one's larger programs. In a few unfortunates the range between peak and valley is huge and destructive, as notably in manic depressives. The causes of the process are still beyond our ken, but they are plainly connected with the dominant brain

centers, the endocrines, and basal metabolism. We know this much at least, for within each up-and-down swing we observe changes in the person's thoughts, in his emotions, and in his gross bodily processes such as respiration and digestion.

I regard it as a fair guess, too, that the energy cycle may start at any point in the linkage. In one person, for example, a stubborn protein in a juicy sirloin may poison the system; the blood stream may carry the poison to the brain and there depress the centers regulating some endocrine gland, which in turn will slow down all bodily processes. In a second person, the retardation may begin with some unpleasant experience, brooding over which sets up inhibiting currents from brain center to endocrine; and the latter in turn acts as a brake on metabolism. In a third person, finally, there may be an inner cycle within one endocrine (or even a cycle caused by some interaction between endocrines), somewhat analogous to menstrual cycles; and this may alter the blood stream, which in turn affects the brain.

A change in the chemistry of the blood stream may shift the whole cycle. Of this I have ample proof in my own personal records following two tonsil operations. For some years before the first operation a slow poisoning had progressed unnoticed up to a critical point, when profound depressions occurred suddenly, persisted for a little while, then passed quite as

rapidly as they had come. As soon as the worst was over, the rise to a state of well being and general joy-of-living was completed in less than an hour. The range between peak and valley was very great, distressingly so, in fact. After the first tonsilectomy, which was incomplete, the cycle changed completely. The swing was vastly slower, much more even in up and in down, and the range was considerably less. Three or four cycles a year seemed to be the rule for nearly ten years; and the depressive phases of each were not only weaker but also vaguer, hence often ignored in the press of the day's work. At length they grew worse, a fresh diagnosis revealed the imperfectly removed tonsil, and another operation ensued—this time with the most striking change of energy cycle and emotional tone. The wave flattened after a month of convalescence. No more highs, no more lows. Now only a fairly even level of activity and a good emotional tone in the middle ranges only.

These long, slow swings seem to be very stable. They are not affected by work and rest, nor by ordinary mild sicknesses, nor by emotional excitement. In other words, they seem to have their foundations in some deep physiological surge. The practical significance of this is clear. Everyone should find out for himself as soon as he can how great this up-and-down swing is likely to be in himself. Business executives have enormously increased their efficiency merely by adapting their work to these perio-

dicities. Do your most important and difficult tasks when you are up and work in your periods of dull, routine, or unimportant tasks in your low periods.

WAVES

Most of us have our daily ups and downs, too. Bodily energy is often low in the morning. Blood temperature rises during the day to a peak late in the afternoon, falling off to its lowest point early in the morning. A few people kept awake and busy during the night have succeeded in reversing the cycle. But as a rule night work is less efficient than day. This was demonstrated in a study of night and day women workers in a cartridge factory. While the hours of work were approximately the same, the night workers produced from ten to seventeen per cent less than day workers, and also lost more time. Many other investigations show that the quality of night work is inferior, while accidents are more frequent.

In some investigations, such as that conducted by the Life Extension Institute at the Solvay Process Company's plant, night workers show certain tendencies definite and frequent enough to mark them off from day workers. For instance, they suffered more from digestive disturbances, loss of appetite, and constipation. They also used tobacco in excess, though just why is hard for me to understand.

Night work is unhealthful, partly because of man's habits, which are adjusted to day work and broken with difficulty, and partly because night work apparently does violence to normal physiological rhythms which, if disturbed, result in general unbalance.

Some people work at peak efficiency early in the morning. Others never get going until after lunch. Still others are at their very best late at night. Rarest of all is the man who hits his pace as soon as he arises and holds it evenly until bedtime.

The morning worker has the advantage in every field of achievement which taxes the muscles. For it is during the hours immediately following sleep that ninety-nine out of every hundred men can exert themselves most strenuously, do things with the highest dexterity, and stick at a job longest without a bad slump. Fewer blunders and smoother performance can be counted on most surely in the first five or six hours after waking up.

No matter which muscles are called into play, the general rule holds. In practising foreign languages, in playing the piano or other musical instrument, in dancing drill, in elocution and acting, and in all the sports most people find it true. But it is complicated by many other factors, of course. For example, people do not seem so much alike in their early freshness of mind. Some wake up slowly and remain sluggish for hours, while others are alert at once.

Some can do nothing before breakfast, while others work at intellectual labors best on an empty stomach. As most high-grade work involves a blend of brain and brawn, the time of day when achievement is favored must depend upon the particular job.

RIPPLES

All work is done in cycles of action and rest. Plainly these are physiological processes, some of which have been demonstrated in the laboratory, while others are so obscure and subtle that they elude measurement. The very composition of our blood undergoes a curious cyclic change.

A primary rhythm in energy flow appears in the hourly change in the number of white blood cells. The constancy of this rhythm is astonishing. Sabin, Cunningham, and Doan, at Johns Hopkins, have demonstrated that every person exhibits the same pattern here. The cells vary systematically in number from 5,000 to 10,000 per cubic millimeter. During the morning hours the rhythmic swing moves in the lower ranges of this total span. In the afternoon it moves in the higher ranges. That is, a man may show a rhythm of 5,000 to 7,500 early in the day, and a rhythm of 6,000 to 10,000 later in the day. His rhythm is not at all affected by eating lunch.

The lymphocytes have a still shorter

rhythm, and all of them are remarkably constant.

As far as we know, nobody has given any adequate explanation of these primary energy rhythms; but the facts are clear.

SPLASHES

There are many conditions under which the energy of the ordinary man is suddenly broadcast with great violence. These diffuse explosions are those of rage, fear, and love. They are vast organic disturbances, starting with powerful discharges of secretions from the various endocrine glands and spreading throughout the motor and the associative sensitivity tracts of the autonomic and the higher cerebral regions. The entire body tends to be involved. The chemical composition of the blood is altered, arterial tensions change, fatigue poisons are neutralized, and the muscles receive more or less blood. After the first stages, there ensues a post-emotional condition of much longer duration, sometimes extending over days or weeks during which the energy level is either raised or depressed markedly and his entire life transformed for the time. For all practical purposes, he may even become "another man."

This much is sure. Now for the more or less doubtful evidences. It has been asserted that the shock of an emotional stimulus throws the organism, for the moment at least, into a chaotic

state. During this chaos the person makes few clean-cut adjustments to his surroundings, thus differing sharply from himself when executing an instinctive act, which is always neatly patterned, swift, and sure (though not sure of success). If the emotion is excessively intense, the chaos passes over into rigor and paralysis, which may become what biologists have called the death feint. This feint is supposed to be useful to the animal in fooling its enemies; and the stimulation of blood and muscle in rage is said, notably by Cannon, to be highly adaptive for combat, heightening the animal's endurance and reducing the loss of blood through wounds.

There is much truth in these views. But a certain demonstrable ingredient of error must be extracted painlessly. In the first place, the chaotic state is by no means universally associated with these primordial emotions. The extent and persistence of the chaos is closely correlated with the volume of energy and the speed of secondary sensitivities. And this amounts to saying that as the sheer power to do work and the richness of cortical associative structures increase, so does the chaotic tendency. Men and women of distinctly low mentality and only average energy will exhibit a certain amount of emotional confusion; but, as a rule, it is slight and evaporates swiftly.

For proof of this, see the ease with which they pass over to instinctive acts of a clean-cut nature, such as running from peril,

putting up their fists to fight, hiding behind a tree or rock to avoid a bullet, and so on. The aim of the psychopathic gunman who draws and fires at a foe in the first instant of rage is much more likely to be accurate than is the aim of a mentally normal man of equal ability in marksmanship under the same conditions. A lively memory, much free fantasy, and a strong tendency to reflect, anticipate, and plan greatly aggravate the initial emotional shock, whether it be pleasant or unpleasant.

It is easy enough to show why this should be so. The more high associative tracts are open to stimulation, and the more sensitive they are (which means the more unstable are their chemical compounds), the more easily will any given stimulus stream through all of them and induce in each one its own specific explosion. Now each such tract is connected with an enormous number of muscles; Sherrington inclines to believe that each one is coupled with every muscle. The tonus of the entire nervous system, as well as that of the muscles, is heightened in a specific manner by each major emotional reaction, by way of the endocrines. This means, on the one hand, that stronger stimuli reach the cortex in great multitudes while the cortical tracts are at the same time made more sensitive to all stimuli. This could have only one result. The inhibitions established by such mental habits as selective attention, frequency of use, and the like, tend to be overcome. The whole cortex is energized in

one upward rush of energy. And hence a horde of motor impulses are released which have no rational relation whatsoever. Everything tends to shoot off at one bang. Chaos follows.

Nowhere can this be more clearly observed than in the behavior of children. Here we are not confused by the interplay of elaborate and deeply rooted social habits, especially those of the inhibitory sort. The most chaotic outbursts of joy, terror, and fury will occur in boys and girls decidedly above normal in rate of learning, liveliness of imagination, and general alertness. True, the subnormal mental types in their early years also hurl their little fists the instant they are enraged, or run at top speed from an ugly dog, or indulge in juvenile petting of the love object. But the two classes differ in "hangover." The brighter children are in a daze for anywhere from half a minute to a quarter-hour. They do nothing well co-ordinated in that spell. The stupid specimens, if they lapse into chaos at all, whisk out of it fast.

Does this not suggest a simple amendment to Cannon's theory that emotions are highly adaptive organic responses? We may—and I believe we must—grant that they are highly adaptive, *but only as organic processes*. In short, they do serve the organs of the entire autonomic system. They also serve the blood well, and the muscles too, *in so far as the muscles are linked with the body below the cortical level*. But there their utility ends. They become hos-

tile to the individual as a thinking, planning, anticipative being. *They are the enemies of the cortex, and largely because the cortex is in a curious sense the adversary of the organs.* I do not say it is the enemy of the organism as a whole. I say only that *it is trying to deliver man from the necessity which thwarts freedom,* namely, the necessity of the reflex and the segmental acts that make up the bulk of animal life.

If emotional explosions do not pervade your entire conduct, they may stimulate you favorably. When checked quickly at the higher levels, they become an aid to achievement. Let me put myself on the witness stand.

Trivial rages tone me up absurdly. I owe much to them. Last spring I had a series of debilitating colds accompanied with an annoying bronchial tightness which caused me to cough at all hours. My nasal passages were completely clogged. One evening I could no longer breathe through the nose. Mouth breathing seemed to start the bronchial cough. So there was nothing to do but treat the nostrils with a certain brand of ephedrine which had worked best with me. So I sent a messenger to the nearest drug store for a bottle of it.

The messenger soon returned with a package. I opened it, only to find a strange preparation the name of whose maker I had never heard.

"Why didn't you get the kind I ordered?" I demanded.

"The druggist said this was just as good."

Now, one of my pet aversions is the retailer who palms off something "just as good" on me, when I ask for a nationally known brand. It is a petty fraud, nothing less.

I seized the bottle and started for the drug store myself, mad all over. And now notice, please! *Before I had taken twenty steps*, my nasal passages cleared for the first time in two or three days. My entire tone was high and pleasant. Within another minute or two my energies had risen in an overwhelming high tide. After a quarter-hour, I was almost at peak; and, had it been desirable, I could have worked hard all evening at anything.

This wonder was wrought by perhaps one ten-thousandth of a drop of adrenin, with a microscopic dash of other endocrine secretions! Hundreds of times I have had similar experiences. When delivering a public lecture, followed by open discussion, it often happens that somebody in the audience asks a question which, to my own way of thinking, connotes either stupidity or meanness; whereupon the little adrenal kick ensues, and I am toned up for endless hours of debate, with never a trace of fatigue. So too in writing. If I read something in the newspaper which vexes me, I can sit down and write reams and reams of discourse on the subject. Years ago I used to do this merely as a method of blowing off steam; and I think

I turned the unwanted energy to good account. For at least I used it in practice. And practice is fully as useful as performance.

When, however, the rage reaction is more intense—as it usually is when the provocation becomes serious—no such fortunate uplift takes place. An inconceivably slight excess of adrenin changes the larger chemisms profoundly. Now it paralyzes action, again it sets up ill organized muscle play, again it induces mild nauseas and insomnia. To beat down such harmful effects, the safest rule is to relax as completely as possible. After a severe shock, though, you may have to keep still for hours, in order to neutralize the poisons.

All this suggests two distinct procedures for conserving energies under endocrine stimulation. You must be your own guide and judge in finding the level of energy discharge at which it pays to use your energy in some useful activity as promptly as possible. Here again you see the value of my other rule about always having on hand several interesting projects to which you may turn. It is a pity to boil over at a time and place where there is nothing to cook.

Make ready, then, for unexpected periods of high activity by having at hand a number of things to be done. Emulate the good engineer, who designs a steam plant so that all waste vapor or excess is shunted into some supplementary machinery, where it either drives wheels at low pressure or heats the factory or

is used in some chemical process. Such procedure is manifestly wiser than the old rule of counting ten when angry. Not that this latter has no uses; it has, as I show elsewhere. But merely checking a rising tide of rage seldom neutralizes the effects of the rage already generated. Our present problem is to turn the fresh energy to account. While making it serve you, turn off the valve by counting ten. But get the last ounce of power out of the energy already released.

CURRENTS

In this tiny guide book I do not wish to embroil the reader in scientific controversies. But there is one great issue bearing on the source, form, and direction of energy flow; and our rules may be confused unless we show where we stand in this matter. I refer to the sharply opposed theories as to the source of driving energy in man.

The great physiologists hold that the environment drives the brain, and the brain drives the organs of the body. Thus Sherrington, Crile and many others. The outstanding psychoanalysts hold that the organs run the brain. Thus Kempf most unequivocally and Freud, Adler, and Jung by clear implication. I reject both views as adequate, but I accept both as partial explanations. In other words, many persons have brains that are run by the environment, while many others have brains that are

run by their organs; then, too, some unfortunates have brains that run their organs just enough to cause early disaster, even death, usually through some worry or introspection. The physiologists come to their conclusion chiefly because they observe normal people. The psychoanalysts reach their hypothesis simply because they never see normal people but only neurotics and the insane. The normal man is essentially one whose brain is run by his environment. Neurotics and certain of the insane have organs that run their brains. Indeed, I incline to the view that we have come here upon the primary difference between normal and deviate man.

This is not so simple as it sounds. Varying enormously from part to part in its receptivities as well as in its channels of discharge into organs and muscles, the brain is run by the environment or by the organs in a rich variety of patterns. Probably we have something close to a normal frequency distribution here, as in so many other fields of mental activity. That is, the normal man shows thousands of patterns of environmental control. If his eyesight is poor, the environment controls his brain but feebly; if he has keen ears, he is controlled powerfully by that part of the environment which sets up air waves in the middle ranges of frequency. And so on. By the same token, the abnormal man is likewise controlled by his organs, not in any such simple fashion as Freud, Adler and

Jung fancy, but in the richest imaginable variety. How else could this be, once we realize that the thirteen or fourteen known secretions of the endocrines may combine in tens of thousands of chemical combinations, each having its own unique potency? Individual differences in sexuality are tremendous and seemingly continuous statistically.

There are reasons, furthermore, for believing that all sorts of mixed control types occur, such as the man whose brain is partly run by his environment and partly run by his organs. A highly extraverted neurotic might here qualify as a specimen. It is reasonable to conjecture that tens of thousands of such mixed control types could be assembled in any large city.

Sexual Energy: Utilizing the Surplus

In most normal people, sex energies are easily controlled by hard, pleasant work and vigorous exercise and play. In a certain number of otherwise normal people, they are not; but such persons offer a problem much too difficult to be discussed here. They should seek competent medical advice. Especially, too, should the highly introverted neurotics, to whom sex seems everything.

The neurotic, whose brain is driven by his organs, wastes immense funds of energy brooding over all sorts of organic cravings, especially the sexual. Both the literature and the psychology of sex have been written either

by neurotics themselves or else by scientists and physicians specializing in the handling of neuroses. Ordinary healthy people pay surprisingly little attention to the erotic issues. They react to the cravings pretty much as to hunger and thirst; that is to say, they either satisfy them, if this is feasible, or else they forget them as long as possible.

Now, hunger and thirst cannot be put out of mind and thereby solved, so to speak. But usually sexual cravings can be. The control that can be—and often is—exercised over love life merely by making resolves and then setting one's conduct accordingly is exceedingly great. Greatest, of course, in people whose brains are run by their environments: least in those who are dominated by their organs.

It seems that neurotics may be gravely disturbed by any blocking of sexual impulses. In extreme cases, such as those reported by psychoanalysts, all mental processes appear to be poisoned, as if by some pernicious inner secretion. (By the way, I wish some competent laboratory staff would make a series of blood transfusions from neurotics to non-neurotics, with a view to discovering whether the mental symptoms of a neurosis may not be induced. It seems reasonable to suppose that a neurosis may often [if not always] be an obscure endocrine autointoxication carried by the blood stream.) If the neurosis is a functional disturbance originating in secretions carried by the blood stream,

we cannot advise the neurotic to reform his conduct and keep his mind on external affairs until after we have cured him of the inner poisons.

And now for the normal person. What technique shall we suggest for the utilizing of waste or surplus endocrine energy of the sexual type? Our first rule is negative but emphatic and of almost universal application.

Never try to use up such energy in intellectual work unless there is associated with it a great deal of gross muscular activity.

Why not? For a simple reason! Mental work burns up too little energy. As an engineer might put it, you might as well strive to empty a great reservoir of city water through a pinhole as to consume erotic energies adequately by reading serious books or studying German. A thousand days of reflection and memorizing would hardly use up one second's release of erotic energy in the blood stream.

In fact, study of any sort during such a physiological condition only makes matters worse. Little or nothing is learned during the vain struggle; so a sense of defeat is likely to take shape and contribute to an eventual inferiority complex. Much of the manifest incompetence of young men and women during high school and college years can be traced to the absurd amount of book work and grubbing and general sitting around and intensive loafing required by the curriculum manufacturers, the

fraternities, and the Big Bum's Book of Good Breeding. College athletics having gone professional, the ordinary students have few chances and little incentive to get out and bestir their sluggish muscles. College society having gone upper-crust, our post-adolescent learners find too many chances and too powerful incentives to ogle the opposite sex, to dance, to sip tea, and to sit in grandstands, elegantly immobile and superbly useless.

Our second rule is positive but of less uniform applicability. It must be skillfully amended to fit individual cases.

Pursue vigorous activities which, first of all, make much use of the heaviest muscles (in arms, legs, and back) and, in the second place, are individual rather than social in their setting and aims.

As to the first feature, only these heavy muscles consume energy fast enough to prove useful here. As to the second feature, individual activities such as walking, horseback riding, rowing, and gymnastics are more likely to cut off at the source the erotic energies than are any activities in which other people share. All social contacts tend, directly or indirectly, to involve some phase of the love life; hence they act as stimulants to sex reactions and, as such, are bad here.

Western society, during the past half-century, has become dangerously over-socialized especially on the lower levels of herd life. (It

is imperfectly socialized at the top.) Everybody sees too much of everybody else. Hence a diffuse, continual erotic stimulation, which is reinforced by the movies, the theater, and the newspapers, all of which cater to the herd for profit's sweet sake. I suspect that thousands of people have been made mildly neurotic by this state of affairs. Could all such get away by themselves and, at the same time, do plain, hard physical work, they would regain their balance in a jiffy. I admit, however, that individual differences play a major role here. We cannot affirm the flat rule in one tenor for all people. Yet it does serve as a general guide pretty well.

CONTROL

"Master of destiny!"

This title is bestowed upon the frontal lobe of the brain by Tilney, our greatest brain physiologist. And never was title more fitting.

In this small, baffling, matchless patch of protoplasm is centered the control over all the energies of the body. It starts things going. It stops them. It amends. It postpones. It lays motions on the table. It sketches a thousand designs and throws away all save one. Personality, achievement, character and happiness are all determined, in the first instance, by this super-switchboard.

It is not the fountain of energy. It is a set of controls. The vast reservoirs to be tapped

lie elsewhere; in the endocrine glands, in the organs, and in the muscles. The frontal lobe touches these off, as a spark ignites dynamite. It is hard to detonate dynamite with a match; more unstable matter must be interposed between flame and charge, such as mercury fulminate. The frontal lobe is the match. The endocrines are the mercury fulminate. Blood and brawn deliver the blast that rends rocks and ruins empires. Just as the energy released in the tip of a burning match is as nothing beside the dynamite explosion, so is the current flowing from the frontal lobe into the thyroid and adrenal glands tiny, when measured against the activities later induced by the explosion of endocrines.

You form the simplest trustworthy picture of the tapping of inner energies, if you imagine a sequence of perhaps hundreds of matches, fuses, caps, and sticks of dynamite ranging in size from one ten-thousandth of a needle point up to the mass of a full-grown man. Microscopic match ignites microscopic fuse which burns up to and explodes microscopic cap, which detonates microscopic dynamite; then this last discharge serves as a match to a larger but still microscopic fuse, which in turn sets off a fuse of its same general magnitude, which explodes a quantity of dynamite, which in turn acts merely as a match setting fire to a higher order of fuse, and so on and on and on up to the final and complete act of a human being.

Herrick * describes the cortical control thus:

"In times of stress a man will outlast a horse, and an educated man may outwork an uncultured man of much more powerful physique because the cortical reserves are available to drive jaded muscles on to intense effort long after fatigue has exhausted the normal capacities of the subcortical apparatus. A part of this superiority lies in the intelligent conservation of effort in the earlier stages of a long program of severe labor and other expressions of the reserves of associational patterns. . . . But a part of this superior efficiency apparently results from direct activation by the cortex, which acts like a spur to an exhausted horse."

Hardly twenty-four hours after pounding out the foregoing words on my typewriter, the energy of the brain was beautifully described in the latest announcements of Dr. George W. Crile. "The dynamics of the brain," says Crile, "seem to parallel the dynamics of the energy processes of non-living mechanisms—such as the internal combustion engine or an electric storage battery."

The most significant points in Crile's hypothesis are these:

The power system of the brain contains billions of individual dynamos or brain cells. These are the gray matter. The cells generate energy and distribute it in a system vastly more elaborate and greater than any communica-

* "The Brains of Rats and Men." C. Judson Herrick.

tion system known to man. Each cell has a positive and negative charge. Electric potential and oxidation are interdependent. Neither can occur alone. Brain activity, furthermore, varies with temperature, electric conductivity, electric capacity and electric potential—just as external electric activity does.

The current generated in the gray matter passes through billions of infinitely complex conductance paths. Here every single human experience from birth to death is recorded.

So you see why it is that, as Crile puts it, "the word 'mind' connotes the work of the protoplasm of the brain. It would be more simple to make no use of such terms as mind and psychic, and instead use the physical terms that are involved. Whether a plant, a protozoan, or a man, the protoplasm in all its forms is influenced in the same way by anesthetics, by narcotics, by want of oxygen, by electrolytes, by poisons, and by variations in temperature. If the plant, the protozoan, the child, is sick, all of its protoplasm is sick. 'A sound mind in a sound body' should read: 'Sound protoplasm in sound protoplasm.' "

XI

Warming Up

"When Einstein thinks hard, he runs a fever."

Some newspapers made much of this fact when the great mathematician first broke into the headlines. But it was much less surprising to physiologists and psychologists than to the reporters. All hard thinkers warm up on their jobs, just as bricklayers and fiddlers do. Indeed, it is easier for a man with a good frontal lobe to work himself into a fever over a puzzling problem than for a member of the bricklayers' union to develop a mild perspiration.

One of my Columbia colleagues, a chemist of note, told me years ago that he often had to stop work for a day or two in order to bring his temperature down to normal. And school physicians will testify that bright boys and girls who become deeply interested in a new subject literally grow hot over it. The brighter, the hotter. The duller, the colder.

Now this raises a practical question. What if you do not naturally warm up to a task? Will it pay to heat yourself up by some device? Or must you resign yourself to a life of frigid

dullness? There is a general answer to this which has many exceptions. Some people simply cannot speed up and warm up. But many who think they cannot are in error. For them the rule is simple.

Any accelerator that works and leaves no serious injuries in its wake is worth using.

Let us cite a few obvious varieties. Start with coffee. I use it in great quantities, for it speeds me up instantly and rarely interferes with sleep or digestion. For me, then, it serves a good purpose. But tea! If I resort to that insidious drug, I am enormously accelerated—but at what a price! Its hang-over is more terrible than gin, rum and arrack rolled into one. The stomach goes on a strike. Sleep becomes a mere tossing. So I abstain from tea. But I know some people who drink it by the gallon and forswear coffee. In a word, then, we are here dealing with personal peculiarities.

Consider another case, exercise. I know a few people who must brandish dumb-bells and do all their morning radio exercises in order to warm up for the day's work. Having tried such, I must confess that it is the surest way to ruin my entire day. Physical exertion before noon is not only repugnant but downright poisonous. Why this should be, I cannot understand; but it has been proved over and over again. Vigorous exercise surely warms up the body as a whole; so, I surmise, most people will find it useful as a means to more effective work.

How about semi-starvation as a mental stimulant? Studies of people who have cut their diet to an absolute minimum and reduced physical efforts correspondingly indicate that the mind grows clear and lively when the body hungers. Many people have applied this law with much success.

Here is a much commoner and simpler trick, probably known to you already and practised now and then. Just as a baseball player warms up before the game by knocking and throwing the ball up and down field; just as football teams warm up by running through signals for ten minutes before the whistle blows, so almost any other worker may whip up his circulation by putting things in order, running through a few preliminary movements, dipping into a book or two, sharpening pencils, arranging his stationery, pulling the curtains down, fixing his chair. A variation of this is to run over the work of the previous day, get the feel of it, and thus swing into one's stride.

Probably the worst minor mistake to be made is to start in smoking before warming up. It is quite certain that, in at least eight men and women out of every ten, the pleasure of a cigarette or pipe is dearly paid for by a retardation of mind—and at the very time when acceleration is most sorely needed. Tobacco, like beer and other narcotics, must be put into its place, which is at the end of a working period, when the worker wishes to let down and forget

his toil. A morning smoker is almost certainly an inferior master of energy.

Warming up to a task is largely a matter of improving attention. It involves, first of all, the complete inhibiting of all impulses that may have been persisting faintly from earlier acts; and then too, it often involves a sharpening of the focus within the new field of attention. Do not suppose, however, that this fact reduces the importance of muscular warming up. Remember that all attending is a "tending toward" something. Remember that tending toward something is moving the eyes, cocking the head, adjusting legs, arms, hands and fingers with reference to the new task.

All such adjustments occur first of all in the central nervous system. We may call them "sets" or "attitudes," if we keep clearly in mind that such processes are the first stages of patterned action. Unless there is a "set" or "attitude," there can be no immediate progress toward the developed outward act of attention, with its ensuing completion of a task. This is why teachers insist that the beginning of all effective learning is the creating of appropriate attitudes. The stronger and clearer the initial attitude, the faster the warming up. The latter does not depend appreciably upon skill. Many highly trained people take a long time to warm up, while wholly untrained warm up fast.

I suspect (but cannot prove) that great slowness in warming up to *all sorts of tasks*

probably is linked with the neurotic constitution most often and with anemic types of low energy almost as often. On the other hand, warming up to a task that is distinctly unpleasant or uninteresting may be difficult for any normal person, hence of no diagnostic value.

E. B. Skaggs, of the College of the City of Detroit, has studied the "warming up" process for three years. His findings result from experiments in manual work. But with only a few amendments they may be applied to warming up in mental work as well.

Under any of the following conditions, you will probably improve your work as you get into full swing:

1. If you are by nature slow in adjusting and readjusting to any given task, you will tend to improve as you get into it. Here people vary greatly. Some take more and some less time to get under way.

2. You will undertake work more efficiently after a period of mental relaxation than if you must switch from a task which has deeply absorbed you.

3. If you are emotionally aroused or excited, your first efforts in a task will be notably less efficient than later ones. As your emotion subsides your work improves. (Remember, though, that in some cases emotions increase your efficiency even at first.)

4. Effort and determination to do a job, especially after poor work at first, warm you

up to your work, provided the job is not beyond your abilities. Psychologists call this "reaction to failure." Probably mild irritation or anger at your poor first results accompanies increased endocrine stimulation, thus heightening your energies and toning you up to a better job.

The more determined you are to do your best from the very beginning, the less likely you will be to have to warm up to the work.

5. If you are "off form," you will warm up after sheer practice. Even people highly trained in the work presented often find themselves not up to the job at first. But they improve rapidly as they get going.

6. In work involving swift and fine muscular activity, you will probably get into swing faster if you "limber up" first. While the results discovered by Skaggs and his colleagues here are not conclusive, the investigators agree that warming up may occur, since all the muscle fibres do not contract to capacity when first stimulated.

7. Probably your perceptions and your thinking are "toned up" following muscular activity and tension, thus improving your efficiency as you go along.

When are you likely not to warm up? Probably in the following cases:

1. If you undertake a job when you are full of interest, effort, and determination to do it well.

2. If you become emotional over the

task as you go along, turning angry, excited, or disgusted with your efforts because you realize that the task is beyond you. Many people tested here remarked that the pace was too great for them, and they broke down under the strain.

3. Under certain conditions of fatigue, you may not "warm up." These, however, we shall discuss in another section.

Warming up in the higher activities is practised by many experts. One of the ablest insurance salesmen in America has for years followed the simple rule of putting himself through his paces just before tackling an important prospect. On the day he plans to call on a big business man with a proposal of heavy insurance, he sets the date in the afternoon; then he calls on two or three "cold cases"—that is, on men he does not know and with whom he has made no previous engagement. To these he tries to sell insurance of the same sort he is going to offer the big business man. Naturally, this is a hard job, so he must exert himself much more. Thus he gets into the swing of the afternoon's assignment, warms up, and improves his approach.

Much preliminary work that seems to be sketching and first drafts in the pictorial and literary arts turns out to be mere warming up. And I think teachers in these fields ought to enlighten beginners on this point, if only for the sake of disillusioning them. Even a gifted writer, at the outset of his career, finds it hard

to get into a piece of work. The difficulty is not at all simple and uniform. Sometimes it is chiefly one of approach: the perspective, the angle of narration, and the specific treatment of the material can be found only by the crude animal technique displayed by the rat in a maze, a hither-and-yon scamper, a sniffing and feeling all around the puzzle. No rule of progress exists, inasmuch as nobody ever before tried to write about that particular thing in that particular spirit. Now, in this hunt for the right course there is always a good deal of warming up which makes the senses and the imagination more alert, often heightening motor activities as well. If the worker happens to warm up slowly, he must be taught to expect annoyingly slow approaches.

XII

Well Begun Is Half Done

"Aller Anfang ist schwer." So say the Germans. As we put it: beginnings are hardest. Well begun is half done. It's the first step that counts. All these are understatements. Begun at all is quarter done. The first step counts more than the next score. I would go even further. In many cases, a task cannot be begun until it has first been finished. Is this a paradox? Not at all! Consider a variety of brilliant acts ranging from a blow by Gene Tunney up to a national unemployment relief program.

Before and behind a knock-out blow by an intelligent pugilist lie years of observation, analysis and practice. Tunney, for instance, used to take motion pictures of rivals and analyze every movement in a slow motion picture projector. Records of the emotional behavior of the rivals would be gathered quietly and subjected to careful research. All by way of preparing for a final act which might last only a few minutes!

Before and behind the winning rushes and swings of Helen Wills and the deft drives and putting of Bobby Jones an incredibly vast

mass of studies, tests, and minute experiments can be found. More often than not, the act seen by casual onlookers is nothing more than the flash of a great gun; the mere instant of detonation in which a projectile is launched, well aimed, well loaded, well timed, against a target.

Most young people and all natural born dubs mistake the visible beginning from the actual. They fancy they can learn golf by walking out and swinging away at the ball. In school they stupidly try to cram for examinations, sometimes fool their teachers, and go on to higher subjects in which they fail miserably.

Once you start doing something, you weaken the impulse to do something else, at least for a while. Nerves through which currents flow seem to offer less resistance than nerves that are resting; so the currents from competing centers drain off into the active channels more readily. This is the foundation of all human effort, planning and success. It is the first universal and indispensable way of tapping inner energies.

The mere act of undertaking a project, no matter how simple, accomplishes much more than blocking rival programs for a time. It weakens the latter by shunting their currents into the field of active forces. Usually an impulse thus absorbed dies out, while the behavior pattern which absorbs it gains in what physiologists call permeability. Currents flow into it and along its courses more freely, while the abandoned courses—somewhat like forest

paths which men have ceased to tread—grow up, thicken, and become less and less viable. Ever more energy must be consumed in crashing through them; hence the human conduct to which they lead grows less and less likely, as the years pass.

So you see that man makes the most of his energies by using them; for in and through action alone can either design or power develop.

The first commandment of the intellect is: "Stop, look and listen." The first commandment of the energies is: "Keep moving!"

Says that eminent surgeon, Dr. Charles H. Mayo: "We find all around us old people who have been dead for years and don't know it. They do not think any more. Their minds have died, although their bodies live on. Life today is too fast a pace. The mind gives out years before the body."

I agree with the assertion as to fact but not with its interpretation. The cause of these mindless lives is not the speed of modern life. Far from it! Usually the trouble roots in lack of mind training. Minds do not give out, as a rule, except as a result of rust and neglect. Nobody ever used his brain too hard. The brain is energized by vigorous exercise. The more it is used, the better it grows and the longer it endures.

XIII

Keep Going!

Once you get up steam in the old boiler, scheme to use all of it before closing down. This common-sense rule of the engineer applies to the human body quite as strictly as to engines of steel. But it is easy to misinterpret.

Do you need hours to warm up to a task? If so, you will gain much by arranging your schedule so as to keep under way, full steam, until your energies are spent. Many warm up quickly, hence they can stop early and often without waste. All others ought to plan for long stretches of peak performance.

Beware of twisting this to mean that, when warmed up, very short rest intervals are to be avoided. You may drop work for five, ten, or fifteen minutes now and then, provided that you do not lose your stride and cool off. You are exactly like a steam engine or a gasoline motor in this respect. Once you heat up the power unit, it remains warm for some time; and during this time, brief stops are quite all right. It may require half an hour in winter to get your automobile to the point of pulling smoothly; but once it does so, you may shut

off the motor at odd moments without making it hard to start again.

Another way of guiding you in this same matter is to consider your first efforts as a running start in a hurdle race or a high jump. Have you ever watched amateurs experimenting with the high jump? Usually they begin with an absurdly long running start. They may go back 150 feet from the bar and run as hard as they can toward it. They waste much energy in this manner. Here we see the other side of the technique of warming up. The unskillful tend to spend needless time and energy in getting under way. This is partly due, of course, to the fact that, in the performance of the major task, they use much more energy than the skillful do; but it is mainly due to sheer lack of practice in warming up. Here is a thumbnail sketch of a literary amateur who has thrown away most of his energies through clumsy take-offs.

This gentleman—whose name, I suspect, is Legion—calls himself an author. He really is a running starter who exhausts himself on the take-off. For many years he has drudged away at writing essays and short stories. In this time he has sold perhaps enough MSS. to keep him in bread and butter, underwear, toothpicks, and an authors' club. But the income tax officials know him not. And here is why.

Bravely he arises around eight and by nine sits down at his faithful typewriter, ready

for his day's toil. He arranges every chair and window shade to a millimeter. He brushes off his desk and sorts all his papers. He inserts a sheet in the typewriter and makes ready. Then? Well, usually he stares for a few minutes at the blank paper, then gets up and paces the floor, hands clasped behind him. Presently he begins talking aloud to himself. He is trying to compose something. Seldom does anything good result. So he seizes a pencil and scribbles notes on a scrap of paper. Soon we see him walking around the house, as if trying to raise his body temperature. Ten minutes he walks—or even thirty. Then he picks up a book and reads aimlessly for a while. In despair he turns to letter writing. He cleans up his tray of unanswered mail. Thus perhaps an hour or two. And now he plunges toward the goal somewhat feverishly. He curses under his breath. He knocks out pages on his typewriter with great clatter and sweat. Noon, and his fingers pause, while his eye runs over the work. All wrong! All wrong! He must begin after lunch, “when he feels warmed up to the task.” Despite years of struggle, he goes on wasting half a day thus; and so frittering away a sizable fraction of his life.

I strongly suspect that he ought never to have tried the literary career. The human waste is shocking; and, so far as I can judge, his achievements will never survive the first read-

ing they get at the hands of magazine buyers. A moment of flimsy entertainment, and they have vanished.

To accomplish any task, learn the art of persistence. Keep everlastingly at it. High persistence, or drive (as most psychologists choose to call it), is the result of many inner forces. Its origins lie far down in the obscurest structure of nerve and muscle. Observe the subtle changes in a man's drive as he grows older, or when he falls sick, or after he has suffered a serious physical injury.

Each nerve cell stores up its own chemicals for work in its own peculiar fashion. (Physiologists call this stuff chromatin, just to have some label for it; but they haven't the remotest idea what it is.) When the nerves work, they discharge impulses into the muscles; and there again we find chemical changes going on, some of which serve to intensify and prolong the work done while some others weaken and retard it. What causes the manufacture of each such chemical? When we know this, we shall perceive the foundations of man power.

In this year of grace, all we know is that some of the endocrine glands, when stimulated by certain brain centers, speed up and slow down the production of those substances. Probably they do not manufacture the energy-stuff, but they regulate the job somehow. The thyroid gland, for example, acts as a governor for the whole body. Let it function too vigorously, and

the body runs wild. Slow it down close to a stand-still, and every muscle and nerve goes dead.

Various activities also produce patterns of persistence, good and bad alike. Habits surely play an important part. Structures change with use. A man who persists at certain lines of work or play changes his nerve and muscle; sometimes this change makes it easier for him to persist along the same old line, and sometimes it blocks the drive completely while opening up new channels. A habit that is not suited to the worker's personal physiological equipment must eventually weaken its own drive.

Again, the thwarting of a drive often acts as a stimulus to it. When blocked, the drive somehow touches off fresh energies which mass behind it. Sometimes they overwhelm the original obstacle. Sometimes they cannot, and then they flow around it and find some new channel of discharge. Sometimes they cannot even flow around it, so they reverse; and then the individual withdraws, runs away, seeks a new environment beyond the reach of the hateful interference. Thus when we fight back, dodge, or flee.

Finally, high persistence always improves under favorable stimulation. Call this latter the environment, if you prefer. For it is an influence acting from without. Suppose that a youth craved to express himself in language: would he be likely to spend a year writing a

novel unless he lived in a society which read and admired fiction? Hardly! In the kingdom of the dumb, not even the king converses well. And if ever he did, would he not soon lose interest in table talk? Any drive which fails to yield its appropriate satisfaction tends to weaken. And most drives are aimed at something which involves the attention, the approval, or the cash rewards due from other people. Hence they "obey" the law of supply and demand.

XIV

Peak and Pace

Your pace is your natural speed of sustained effort. Your peak is the highest speed you can reach in a brief spurt. In a man of high energy the difference between peak and pace is usually great. In a man of low energy it is small. But the relation between the two is much more complex than this simple contrast indicates. As it influences performance profoundly, we must look into it closely.

Take pencil and paper. See how many dots you can make in two seconds, then in five, then in ten, then in a full minute, then in two minutes. Push yourself at top speed. When done, count dots. You find the number in each succeeding second of effort diminishes. In the first second of each try, you may have made six or seven dots; in the fifteenth second you have made only one or two. Some people cannot go on at all with the dotting after two minutes.

This is a general trend in all activity. To increase the speed of a race horse or a human sprinter by 1% is to reduce by about 9% the time during which that peak can be maintained. In shop work every employer finds the same

peculiar relation: push the workers even a little faster than they naturally jog along, and they at once bungle the job. A tool is dropped, material is spoiled, a table is tipped over. The desired gains of faster output fail to materialize.

Every spurt must be followed soon by a rest, for the spurt consumes an inordinate amount of available energy. Little by little, factory managers have been compelled to allow their workers a brief pause every ten or fifteen minutes, especially in departments where machines and operations move faster than the common pace of mankind. Men cannot be paced to machines. Machines must be paced to men. As men differ, so may machines. Many workers, many tempos.

In general, young people—say between twelve and twenty-five—spurt better than their elders. Men spurt distinctly better than women. Apparently negroes spurt a little better than whites, if we may conclude anything from the curious fact that in Olympic games and other major contests the black contestants often defeat all rivals in such purely spurting activities as the running broad jump, the hundred-yard dash, and the hurdles; but they never excel in the long-drawn-out, gruelling events. This seems to harmonize with the fact, apparently well established, that negroes have a somewhat smaller fund of available energy than whites.

People with exceptionally active thyroids spurt better than others; as they are

usually thin, they may give rise to the impression that thin people, as such, are good spurters. But this is an error; for many thin types are not at all hyperthyroid but rather anemic or simply under-muscled and hence not good spurters at all. For purely physical reasons, very fat people cannot spurt well. The inertia of bulk alone is enough to explain this, I think.

Anything done with many starts and pauses uses more energy than the smooth flow. Test this for yourself. Take a pen and try to write your own signature by moving the pen a quarter-inch at a stroke. After a few minutes you will notice the enormous waste of effort. It will also be clear that the resulting signature is much poorer than the free-flowing one. Repeat this experiment with a dozen or more activities such as composing a paragraph on some topic, sketching, talking, walking, and so on. Always the same outcome!

This is why the first rule of every sound technique of dexterity is the same: *follow through! keep moving!* Get the feel of the act as a whole, never as a broken sequence. If you must think as you act, be sure that you do not stop to think! This is just another way of stating the psychologist's precept that it is best to learn things as wholes. Learning proceeds the same regardless of the thing learned. A movement, no less than a theory or a French conjugation, should be seized and executed as

a single entity. Then and then only is the highest economy possible. Then and then only is the utmost of grace fused with the utmost of success.

Here we come upon one of the gravest handicaps of a certain sort of intellectual. He inclines always to analyze everything he does from instant to instant; and his mere act of attending to details serves as a brake, so that he advances jerkily. With each pause he first slows himself down, then compels himself to waste energy in overcoming the inertia of the instant. No wonder he is in danger of learning slowly, painfully and clumsily!

XV

Design and Power: The Plan of Action

Power without design is mere chaos and futility. Design without power is a pleasant idle dream.

A clear perspective of action must be won before energy can be economized to the utmost. It is not enough to see the end desired, merely as an end. You must get the feel of the entire sweep and pattern from start to finish. This is what the artist gets before he draws a free-hand line in portraiture. This is what the singer grasps when memorizing a melody. This is what the business organizer intuits through a maze of office detail and market tangles. This is what Leonardo da Vinci had in mind when he wrote: "Design is for the master, execution is for the servants." Design, in this sense, is the total sweep of structure, in terms of action. It is, as some psychologists would prefer to say, the inmost nature of a "set" of mind, or an attitude.

Merely memorizing details of an act brings no mastery, no accomplishment. If it did, then every schoolboy who hammered into his head all the French words and the French

grammar would speak French fluently. The pattern of French, as a living function, is not to be found either in its words or its rules. Both words and rules are mere incidents in a linguistic flux which has its own broad designs and directions. Unless the learner comes to feel this flux-form, he fails. And thus ever. The absolute limits of anybody's learning are to be found at that point where he can no longer grasp the "form-quality" of the details over which he labors. When he can no longer see the wood for the trees, he is lost.

The even pace, then, rather than a series of spurts, makes the best use of your energies. How proceed then? Simply by analyzing the job in hand from the point of view of the amount of ground to be covered and your natural velocity in the work called for. Here is a simple illustration.

I am asked to write this book in shortest possible form and to have it ready within four months. I study my calendar, first of all, and find that, in the following 120 days, 42 are already filled with university lectures, conferences with students on their MSS., faculty meetings, and one or two engagements out of town. This leaves 78 days. From these I must deduct at least 20 days for my spring gardening and chores around the farm. Now I am down to 58 days. Here is my maximum time for the book job.

Next I study the job itself. It will run

to 45,000 words, more or less. Before a page can be typed, about 200 items must be verified and rounded off, by going back to scientific journals and monographs. From a careful study of several hundred cases of similar research and reference work in the course of editing the *Encyclopædia Britannica*, I find that this entire task will consume between 225 and 275 hours. Roughly half of it can be handled by Katharine Johnson, and the other half by myself. Let us say that, working not more than six hours a day at this fatiguing labor, we can clean it up in 19 or 20 days. So we still have some 38 days left for writing the book. If I turn out only 1,500 words daily, then the work will be completed ahead of schedule.

As a matter of prudence, allow six or seven days to be filled with unforeseen work. Even so, a steady pace of 1,800 words a day is possible. But unfortunately this does not please me because it is too slow. I would have to put on the brakes, and that would prove disastrous. I must therefore reallocate the labors so as to attain the best tempo, which is about 4,000 words a day. This demands only 11 or 12 days of actual composition. So what I do is to hold this speed and turn the book in ahead of the editorial dead line.

Mussolini organizes his energies relative to his work so beautifully that I cannot resist quoting him at some length. He told the

Fascist Grand Council how he accomplishes so much:

"I have set my motor to a program. I have rationalized my daily work. I have reduced to a minimum all dispersion of time and energy. And I have adopted this maxim which I recommend to all Italians:

" 'Plan each day, and then methodically execute that plan. Leave nothing to chance; nothing for the next day. Routine work should be performed with mechanical precision.' My labors seem light to me because I love them. In the difficult ones my will is sustained by faith and my mind easily obeys my will."

Since taking charge of the government, Mussolini has never had a vacation of more than three days. Then he drives about, or visits his family in the country, or inspects his experimental farm in Romagna.

Here is a sample day: He rises at seven, or a little before, and rides one of his six horses for an hour. Then he fences with his fencing master. After this, he takes a shower bath, eats breakfast of fruit and milk flavored with coffee. He drives to the Palazzo Venezia, works all morning, and returns for dinner about one. He usually eats a salad, meat or fish, and fruit, and drinks milk. Occasionally he smokes a cigarette. He relaxes in the early afternoon, and sometimes naps or takes a swim. Often he takes care of his correspondence between four and five-thirty in the afternoon,

receives visitors or discusses affairs with his Ministers. He drinks a glass or two of milk; then works till eight-thirty, has supper of milk and fruit, chiefly, at nine; reads, attends a meeting of the Fascist Grand Council at ten, or, if there is no meeting, continues his reading or plays his violin until late at night.

Magnificent energy is paralleled only by magnificent direction. Mussolini achieves peak performance through fine power in a beautifully clear perspective of action. I would not hold him up as a model, however, because his native abilities greatly surpass those of even our abler leaders.

Few people have minds sufficiently alert and comprehensive to hold the pace of Big Business. A corporation employing thousands of workers, having branches in a hundred trade centers, and buying raw materials in a score of markets presents, at every hour of the day, problems of finance, credit, research and general policy each of which involves hundreds of variables. Usually some of the issues must be met and cleared up more rapidly than even a good mind can function. Hence much guessing creeps into decisions. The department heads work in a fog, while the directors work in total darkness. And sooner or later the crash comes.

In America, during the past century, men have been selected upward for the managing of large affairs chiefly on the basis of push, pull, and pep. Up to a certain point these quali-

ties have served well; but they reach their limit when world business attains a certain scope and tempo. Some time before the limit has come within hailing distance, the leaders show signs of strain. They strive to think as fast as the situations demand and to plan programs adequate to the complexity of the circumstances. This exhausts some while it fills others with vague fears of impending catastrophe. Those who grow tired try to relax but cannot. In their effort, they resort to all sorts of forced-draught methods of resting—a crazy contradiction, of course. They smoke heavy cigars all day. They gulp highballs from morn till even. They play golf until they drop. But all to no avail. The end comes as ordained. Then the receiver enters, locks the front door, and posts his sign, while creditors rage and stockholders weep. Thus ends the tragedy of the Man-Who-Bit-Off-More-Than-He-Could-Chew.

XVI

Rules of the Power Plant

If you are under medical care, pay no attention to any of these rules. Wait until well!

If you are very young or very old—let's say under fifteen or over sixty-five—do not expect to gain much from these recommendations.

If you are decidedly neurotic, lay the book aside, for it will not help you but may even upset you.

If you are sincerely averse to improving your lot by hard discipline; if you prefer to live along easily, taking things as they come, and being content with small comforts, give this book away to some ambitious youth. It is not for you.

HUMAN ENGINEERING

Each human being is born with a certain amount of available energy and with a certain tendency to burn it up at a fixed rate. How then can we offer him advice about its use? Is this not like trying to tell him how, by taking thought, to add a cubit to his stature? We cannot put into his body more energy than

he generates by nature, can we? And we cannot do much to regulate his rate of burning, or his basal metabolism. Isn't it rather silly, then, to draw up a lot of rules about energy?

Not at all! For there is something to be done with one's energies, regardless of the amount and the way they burn up. How much is to be spent on a particular task? Suppose you must carry a heavy valise upstairs. You may do so in many ways. You may shove it along on the floor to the first step, then put your shoulder under it and heave it up a foot; and so on, in your best clowning fashion. Or you may lug it in your arms as if it were an infant; or pick it up with your right hand, or with your left hand, or with both hands. Now each method uses a different amount of energy. So you have a free choice which makes considerable difference to your career, though you may not realize it at the moment.

Thus with almost every act. There is some one way of spending the least energy, and a million ways of spending more than needed. It does not depend upon how much energy has been bred into your system nor upon the speed at which you burn up. A hundred men of various physiques and metabolic rates may all adopt essentially the same method of performing a task. If the method happens to be wasteful, the strongest man will suffer least in the long run, while the frailest will suffer most. For the

strong is not drained by little losses nearly so much as is the frail, who must conserve every ounce of strength in order to get through life most successfully.

So this book discusses the techniques of efficiency much more than the creation of new energies. Efficiency is the relation between energy spent and results gained. To attain high efficiency, you study all the effects of each act; you notice the points and moments at which the same good result can be gained simply by cutting out lost motions, or by moving a trifle faster or perhaps more slowly, or by pausing to rest at fixed intervals, or by changing your method of holding tools, or by saying certain things to people under you.

All this is engineering, nothing less. It calls for complete objectivity, freedom from emotion and sentiment, and a willingness to compute to the finest shade and measure. Throughout our discussion, you must regard your body as a super-automobile which can be made to function properly only when hundreds of very precise adjustments have been made.

Bear in mind that each rule must be applied in some minor variation to your own case, according to your age, sex, kind of training, general health, aptitudes, and ambitions. Usually common sense will guide you in fitting a rule to your own personality.

PLAN! PLAN! AND THEN PLAN!

To tap your energies most effectively, you must first learn what you want to get out of life. You can learn this only through long and careful study of things and people, including yourself. Do not expect to reach clear conclusions early in life; for you are changing in mind and body throughout the first third of your years, and each change shifts the scene and your own perspectives. Rare the man who finds himself without going through a long period of hard, clear thinking about his interests and his opportunities.

Eighty out of every hundred men of high achievement as listed in "Who's Who" began planning their careers early in life, usually during their 'teens. (Burnham's careful interview with 1,000 such first established this fact, which has later been corroborated by various investigators.) Many of these distinguished men testify to having written out elaborate studies of their own interests, wishes and abilities during high school and college years. Others made surveys of opportunities as best they could. Others called on prominent men in fields that appealed to them and gathered information and advice. Can anybody doubt that this methodical foresight had much to do with later success?

But many equally ambitious people have failed largely because they did not make a sim-

ilar analysis of their own energies and did not set out to train themselves as machines. Merely finding the right career is no guarantee of victory. Having found it, one must discover early just what powers and sensitivities it requires; and just how one may develop such.

Do not be in the slightest degree disheartened if, up to your thirtieth year, you cannot make up your mind exactly as to what you most keenly desire. Test and try many attractive projects, as long as you remain uncertain. Out of such experimenting wisdom will come—if ever.

While waiting for your larger career to assume clear form, apply our rules to local and partial aims. For instance, if you are in college, apply the rules to your task of studying. If you go in for college athletics, apply the rules to the energies you consume in such contests.

Skill in using energy in such special forms is not transferable to other enterprises, except in so far as the latter resemble the tasks in which you have formed good work habits. A man may become absolute master of his energies in the mile run or in Latin prose, and yet bungle and waste his powers in trying to run a meat market or a farm.

STORING UP ENERGY

Food and Drink

Provided you are not excessively stout, maintain substantially the same weight from

month to month, have adequate energy for your work and no serious digestive upsets, be guided by your appetite in the *quantity* of food you require, but not the *quality*.

To insure proper quality, let your diet be varied, and include liberal quantities of fresh fruit, vegetables, and milk if the latter agrees with you.

Pay little attention to the many tables of normal weight which various authorities issue from time to time. Individual differences loom large here. In my opinion, people may be in the pink of condition and still vary from seven to eight per cent from the weights given in such tables.

Prefer natural to prepared foods.

If you work hard with your muscles or exercise much in the open air, you require more food than if you spend most of your time sitting down.

A diet for sedentary or intellectual work should include 30 calories of food per kilogram of body weight every twenty-four hours. Eat protein and starch in moderation.

If you work moderately hard with your muscles, allow 36 calories per kilogram of body weight every twenty-four hours. Eat around two and a half ounces of meat daily, and a moderate amount of starch and sugar.

A diet for hard physical work should include foods high in carbohydrates, and a total of between 50 and 70 calories per kilogram of

body weight per twenty-four hours. Eat any form of wheat, sugar, most cereals, beans, rice, hominy, prunes, raisins, dates, bread, and potatoes, and not more than seven ounces of meat daily. Beware of cornmeal, which, though high in carbohydrate, is low in its availability.

If you normally eat little protein and do little heavy labor, you are in poor condition for a sudden overload. If you must work hard, increase your protein diet on the two or three days immediately before the exertion starts.

Especially after thirty-five, eat less meat, fish and eggs, and more fruits and vegetables, particularly those high in vitamin content.

Try eating malt sugar just before doing hard work requiring strength and speed. Do the same with phosphate. This we discussed on pages 66 and 67.

Experiment with tea and coffee. They may or may not agree with you. Your "instincts" here will probably guide you reliably.

If you must do hard physical work in warm air, try adding a little salt to your drinking water. Miners did this and became exhausted less quickly when drinking water with as little as a fifth of one per cent of common salt. Probably the salt thus taken serves to supplant some of that lost in perspiration.

Unless you take liquids in other forms, drink at least six glasses of water daily.

To work efficiently, refrain from all al-

cohol. But if you have difficulty in relaxing after hard mental work, try brisk exercise. If that fails to let you down, try drinking beer or ale in moderation.

Eat in a quiet place whenever possible. Noise reduces the stomach secretions and thus slows down digestion. The least harmful sounds are those of conversation. A shrieking radio or similar atrocity cuts the flow of saliva to one-half of normal. The sooner you digest your meal, the sooner you are fit to work at top efficiency.

Eat slowly, of course. But don't be afraid to gulp your food, if you must hurry; for gulping is much less harmful than physicians used to believe.

If you must eat in a din, drink coffee and eat sugar in any form you prefer, be it an extra spoonful in your coffee or a helping of candy after your meal. These foods speed up digestion and offset the bad effects of noise to a considerable degree.

If you are healthy, eat when hungry. Cultivate the "nibbling habit." Many recent experiments indicate that digestion and working efficiency are greatly improved by five or six meals a day rather than the standard three, provided you do not increase the total quantity or change the quality required for good health.

Dieticians sometimes advise you to eat less food in summer than in winter. Beware of

following this rule blindly. Many people get their only chance of heavy physical exercise in the summertime. They work in offices all winter, and get little opportunity for even moderate exercise. Therefore they probably will want to eat more in summer than in winter. Regulate the amount of food you eat chiefly by the amount of energy you burn up.

Avoid hearty meals just before heavy work, when fatigued, or when doing hard mental work. When greatly fatigued, don't eat until after you have rested.

If you are highly strung, light weight, or under-nourished, don't go many hours without food. Between meals eat a little, or else drink something nourishing, like milk, buttermilk, or chocolate malted milk.

If moderately weary toward the end of a day, try eating sugar in some form.

Never eat while angry or frightened. If possible, wait a full hour after your rage or fear has passed. Why? Because your adrenal glands pour something into your blood that draws the blood away from your entire digestive tract.

Never take a bath until at least two hours after eating.

Find your own best behavior after meals. What happens if you lie down? Many people are knocked silly if they do this. Their stomachs slow down, and food lingers there much too long. What happens if you exercise vigorously?

Probably this upsets digestion still worse, though some workers seem able to go straight back to heavy labor soon after a square meal.

Most people are probably helped by very gentle exercise after eating. This stimulates the digestive processes favorably, as a rule. The stomach empties fastest then. Standing up is probably better than lying down, except for certain nervous and aged types of people; for the basal metabolism is higher then.

Suggestions about Exercise

Be in fresh air as much as possible. If you normally get little recreative exercise, walk to and from your work and appointments.

Work and play at high speed if you are young and healthy. Pull in a little during your thirties, and still more after forty.

When young, avoid committing slow suicide by rowing in college crews and playing on college football teams. These games kill. Listen to the warning of Dr. Bolivar J. Lloyd, of the United States Public Health Service:

“Too many older men who were football players in their youth are succumbing to heart disease as a direct result of having overtaxed themselves on the playing field. Football as it is played today is not worth the price in human life.”

Strenuous rowing has much the same effect on the heart.

When past forty, give up tennis. Play

golf moderately, if at all. If this seems to fatigue you unduly, give it up at once. The older you are, the more slowly you tend to recover from exertion or shock.

Exercise in cold but not too cold air in the nude helps to harden the skin and aid digestion.

Air, Heat and Light

Live as much as possible in rooms thoroughly cross-ventilated. Otherwise, get fresh air by opening windows at top and bottom. In winter, use an inexpensive ventilator available at any good hardware store, to deflect cold air upward and prevent drafts.

Get into the direct sunlight often, except on very hot days. Thus you increase your resistance to disease and infection. Never remain in the sun long enough to burn seriously or blister. Nude sun bathing is healthful. But begin easy. Expose yourself only five minutes on the first day; then increase the exposure by five minutes each successive day up to an hour or so. Thus you progressively bronze the skin, but do not burn.

Use ultra-violet- and infra-red-ray lamps only under the direction of a physician. No lamp is an adequate substitute for sun rays.

Keep the temperature of your living rooms and offices around 64° F. with a humidity of about 45%. Never allow the latter to drop below 30% or to rise above 60%. Hot, dry air

hastens the evaporation of skin moisture and often increases susceptibility to colds. In winter, put small basins of warm water at the base of registers and radiators if the air is even moderately dry.

Mental work can be done with reasonable efficiency in stagnant air at about 85° F. It is best done by most people in fresh air at 60° F. If the air is humid, don't exercise much when doing mental work.

Physical work, on the other hand, is best done when the temperature is 68° F., the air 50% humid, with about 45 cubic feet of fresh air a minute around your body. This optimum varies slightly for factory workers, who seem to work with greatest comfort in a temperature of 70° F. with the air 40% humid. At 80° F. and 20% humidity, or at 90° F. and 25% humidity, they work without discomfort. You must never do physical work at 90° F. with humidity at 65% or above; and do as little as possible when the humidity is only 50%.

If you must move to another town, choose one in a similar or warmer climate, not a colder one. Otherwise you will probably adapt yourself with difficulty to the climate, and be markedly hampered for some time, if not permanently.

A Few Rules of Hygiene

Wear comfortable clothing. It should never be tight. The normal foot is broader at

the toes than at the heel. Buy shoes accordingly, unless you are a slave to fashion. The toe of the shoe should allow your toes to move around comfortably, and the heel and toe should conform to a straight line drawn from the inner extremity of each. Never buy pointed shoes, and avoid high heels.

Sit and stand in a comfortable posture. The old rule of head up, chest out, chin and stomach in, if followed slavishly, burns up more energy than positions that leave you more at ease. Keep the muscles of your abdomen firm and taut. Follow this rule both in standing and sitting. The ordinary chair tends to make this difficult. If so, insert a small pillow. When working at your desk or table, keep close to the desk, sitting well back in the chair. Lean over from the hips, not the waist. Never bend the head from the neck at a sharp angle when reading and studying. You strain muscles unnecessarily, and tax the eyes severely.

Avoid harmful dusts. These include flour and starch dust, which may explode, and dusts like those from sand and alkali, wood, bran, coal, clay, minerals and stone, which are harmful to the respiratory system. The dust from ordinary soil is usually harmless.

Keep clean, of course. Probably a clean skin gives off body heat more efficiently than a dirty one. And heat thus dissipated eases the load on the kidneys at least measurably.

Beware of too many cold baths. How

many is too many? You must answer that for yourself. Much depends upon your age and the sort of work you are doing. A man engaged in heavy labor warms up, perspires, becomes unclean, and perhaps has difficulty in cooling off. He deserves a shower as cold as he likes; for it speeds up his return to normal balance. Whatever heat he wastes thereby earns a high dividend in various ways. On the other hand, people in arm chair pursuits often stand under a chill spray on arising, in order to start circulation. While this practice is harmless for many, it is a danger to others; and, if not a danger, then at least a waste of human energy.

Taking as par 100, the healthy city dweller has a hæmoglobin count of about 90. Any drop below this is likely to reveal itself in some disturbance of energy. Have your doctor check up on you here from time to time.

Check up on your heart occasionally. It beats ordinarily at a rate of 65 to 75 times a minute. In a man who keeps himself in tip-top condition, it pumps more slowly when the body is at rest. The heart of an athlete in the pink of condition may run as slowly as 45 beats a minute. The heart of a man who works at fairly heavy tasks outdoors and takes decent care of himself often runs at 55 beats a minute.

Beware of tackling any sudden heavy task if your heart, while you are resting, beats faster than 90 times a minute. This means that it cannot carry the tremendous overload de-

manded by severe exertion. It lacks the necessary margin of pick-up.

If, for long periods, you notice a tendency toward mental confusion, ask a doctor to check up on your blood pressure, which may be too low.

Don't dose and dope. Don't buy *any* patent medicines except under the advice of a physician. Keep away from all purgatives and laxatives as much as possible.

Give up completely if you are normally healthy and taken ill. Don't attempt to "carry on." Giving in at first saves you a month of trouble.

ORGANIZING THE POWER PLANT

Develop the habit of entering a work schedule on your calendar. Make a note of the times when you are likely to be subjected to unusual energy demands for some hard work. Regulate your activities to pile up your energy just before these days or hours of extra effort. This is what any good engineer in charge of a power plant does. He organizes his staff, his equipment, and his full supplies for peak loads. So must every human being who wants to make the most of his energies.

Work Cycles

Never expect even performance in any work or play. Unless you are a freak, you have

your ups and downs. When up, your mind is keen and fast, your muscles nimble and slow to weary, and your interest in things vivid. When down, you are either sluggish or restless; you dislike having to think hard, you bungle simple tasks, and you may show bad temper.

Begin early to keep a record of your ups and downs. It will almost surely turn out that these show a fairly uniform swing. Five, six, or seven weeks most commonly elapse between two ups or two downs. As soon as you have found when you are up, arrange your work, if possible, so that you perform your most important and difficult tasks when at your best; and conversely, when you know that you will soon be down, undertake nothing of consequence then.

Are you ready to go as soon as you arise in the morning? Then, if you are compelled to perform several kinds of work in the course of a day and are at all likely to be fatigued by them, arrange them in the following order:

1. Start the day with the job demanding the greatest *speed* and the highest *dexterity*, particularly of the eye, ear, and small muscles, such as those of the fingers;

2. Proceed next to the task calling for less speed but equal dexterity;

3. Next tackle the job that requires more brute strength than either speed or dexterity;

4. Take up last of all whatever duty

exacts of you the least speed, the lowest order of dexterity, and the lightest physical exertion.

But what if you are the sort of person who wakes up slowly, remains dull and sluggish for some time after breakfast, and picks up to peak performance late in the morning? Then reverse the order of these four rules. Furthermore, reorganize your day if you are this sort of person and most of your important work must be done in the morning.

A nation-wide investigation indicates, in fact, that most work falls in morning hours. Business organizations, such as the General Electric Company, the People's Gas Light & Coke Company, James McCreery & Company, and many others reported that most of their important work is done in the morning. Leading universities and grade schools report that seventy per cent of all important classes are held in the morning. And the Ladies' Home Journal, Woman's Home Companion, Pictorial Review and other women's magazines found, after reports from 25,000 homes, that likewise most of the average woman's work must be done before noon.

The constitutionally sluggish morning worker, then, should arrange his day as follows:

1. Find the minimum number of hours required for completely restful sleeping;
2. Find the average number of hours required for pick-up in the morning;
3. Advance the hours of sleep so as to

bring the first working hour of the morning into the first hour of complete pick-up.

For example, here is a person who takes three hours after arising to hit his pace and finds that he cannot shorten this by any known trick. He holds a job which begins at nine o'clock in the morning. He finds by experiment that his minimum period of completely restful sleep is $7\frac{1}{2}$ hours. Getting from his house to his office consumes half an hour. So he should be asleep at ten o'clock. If he finds that it ordinarily takes 15 minutes for him to go to sleep, he is in bed at quarter of ten and wakes up at five-thirty. This allows time to dress and three full hours to get going at full speed by nine o'clock.

If you are prone to easy anger, make it a fast rule to have on hand several hard jobs on which you may vent your excess of energy in a rage. I have watched people knock out, double, treble, and even quadruple their ordinary amount of work while furious over some petty annoyance. Most of us find it easy to transfer our emotions to irrelevant outlets. Therefore we ought, as wise engineers, to see to it that the outlets chosen serve some use.

In general, emotional excitement interferes with peak performance. Allow time to get over it before you expect your best results. When in a low emotional state, however, you may work more efficiently simply because irrelevant distractions fail to stimulate you. Therefore do not quit working and sit around dole-

fully when you are depressed. On the contrary, work all the harder.

In handling people on a job, never waste your energies by getting mad at them nor by angering them. The human energy used up in the United States in the form of hot emotions which have interfered with efficiency is probably more than enough to manage the entire country, its business and its technologies.

Discharge, as quickly as possible, a worker who habitually shows anger, either toward you or toward anybody else with whom he must work. He is merely so much sand in the gears of your machinery. When you drop him, do not argue with him. But after he has left, it may be a kindness to tip him off about the price he paid for his wasteful temper.

In "warming up," use any harmless accelerator such as tea or coffee. Experiment with the conditions described on pages 61-63.

Also try systematically to warm up by going through the motions of the work to be done, just as football players do before the game opens. If there is nothing else to be done, go through all the motions of arranging your desk and your work place, your tools, your machines, or whatever else you must soon be using.

When taking up a task that is mainly a series of acts all of which you have previously learned well, you ought to strike your pace in a few seconds or minutes. Warming up here is a negligible prelude. But it becomes longer and

more serious as the task grows complex; and it is most important of all in tackling work much of which is strange. In this last instance, warming up cannot be sharply separated from learning the new elements.

A rough-and-ready rule of self-study runs thus: if you spend five, ten, or fifteen minutes in apparent warming up on a job easily performed and thoroughly mastered, the chances are that you have some inner resistance to doing the work quite apart from the warming up mechanism. On the other hand, never expect good results early in any work full of unfamiliar details. Be prepared to spend much time in trying and testing, in making false starts and beginning all over again. If, for example, you are suddenly called upon to write an editorial for your local newspaper, an assignment strange to you in spite of the fact that you may be an authority on the subject of the editorial, you will do well if you spend five times as many minutes over it as a professional writer would; and it will not be at all unusual if you sketch eight or ten introductory paragraphs and throw all away as wrong.

Once you have warmed up to a task, keep moving. Work steadily at your natural pace. Never waste your energy in spurts.

Analyze each job from two points of view: the volume of work, and your natural speed of accomplishment. Adjust the former to the latter.

Never undertake more than you can achieve with comparative ease in a given time.

Some people burn up their energies at a rate nearly 80% faster than some others. Plainly such fast-burning people are best fitted for types of work and play that would never suit slow burners. Where do you happen to fall in this cycle?

RULES FOR PEOPLE OF LOW ENERGY

Don't live in an environment where you must use up your physical energies in running, standing, walking, and similar activities. Especially avoid living in a big city, if possible.

Refrain from emotional excitement of any kind.

Don't attempt to spread your activities widely. Learn to do a few things well and to follow a few interests (preferably mental) thoroughly.

Deal with people as little as possible. Especially avoid the labor of influencing people. Keep away from salesmanship, personnel management, and other fields of work where personal contact and influence is vital.

Do as little physical work as possible. And what you must do be sure to do in the easiest possible tempo. For example, walk upstairs at the rate of one step a second, at the fastest. Time yourself. If this gets you out of breath, slow down.

Always cut corners. Never rise in a train or street car until the car has come to a full stop; nothing is gained by standing up earlier.

Let the other fellow push the revolving door. You slip in behind him and get the benefit of his exertion.

Beware of working in dust or in noise.

Study your own peculiar limitations of energy minutely. Arrange all your exertions in the light of these.

THE ART OF SAVING ENERGY AFTER FORTY

Never open third-class mail. This saves several hundred calories a year.

Always dodge the rush hour, if possible.

Always dodge bargain sales, if possible.

Never look backward except for *information*. Waste no time over memories.

Create a Buffer State between yourself and the Public, to take up all the needless shocks, encounters, high pressure sales talk, and so on. Hire a well-trained secretary. Or an office boy. Or lock yourself in!

Spend a few minutes every day scheming short cuts in your own work.

In answering letters, follow Irving Fisher's technique. (See page 290.)

Never pick up things an able-bodied woman has dropped.

Never give your seat to an able-bodied woman.

Rest whenever you feel like it. Pay no attention to etiquette here.

In all jobs, you do the headwork, and make younger people do the footwork and the tongue work.

Enjoy every least success. Analyze your failures, but never mourn over them. Grieving is pure waste of energy. So is repentance. Never frivol away your powers in remorse.

Wear loose clothes.

Always relax when you sit down.

Read no trashy books and magazines except by way of filling in time you can put to no better use.

Find a few people whose conversation pleases you. Cultivate them like rare flowers.

Always cut corners.

BOOK II

TRANSMISSION LINE

I

Clear All Wires!

One half of the art of using your energies centers around the task of keeping the lines clear. Each least nerve tract in your body carries currents. To do this, each must be well insulated. So there grows around each, early in life, a membrane of inconceivable thinness which serves the usual two functions of ordinary insulation on an electric cable. The first function is that of keeping the nerve currents within bounds and channelling them all to the muscles and brain centers where they accomplish the most. The second function is that of excluding all currents and chemisms arising outside of the line. Were these to leak in through the insulation, they would somehow mix with and change the nerve current so that it would not regulate behavior properly.

Now, just as each single nerve tract must be thus protected against leakages of energy in two directions, so with each system of nerves, no matter how large and how intricate. Ideally, then, we would first learn how to detect and locate each leakage, as it arises, and then we would invent methods of stopping it. Com-

ing at the problem in the spirit of the engineer, we see at once that there may be three varieties of leakage, with respect to location alone. First, at the generator; secondly, along the transmission line; and finally at the motor. That is to say, in the central nervous system; or along the nerve tracts; or where the nerve current discharges into muscle fibre.

Had we the space here, we could fill several hundred pages with details of these leakages. But as this is a compact handbook and pocket guide, we must present the barest outline—and hope that you will grasp its broader implications.

The beginning of all transmission of energy is a matter of attention. We first tap our energies in the act of facing the task at hand. If we have learned how to face it, we improve our chances of success. If we fail, we are likely to botch the work. The art of attending is the foundation of energy economy. Any treatise on self-improvement which ignores that art is not worth reading. Any school which turns out students who cannot control their attention effectively is a failure, regardless of its other merits. The art of attending can be learned only through long practice and stern discipline. I offer no short cut. We economize on energy chiefly by establishing effective habits of attention.

II

The Art of Attention

Attention is a moment of relative rest in which we hold ourselves open to stimuli from some particular source. When we attend, we adjust all the muscles of the body so that the sense organs being used are in the best *position* and *condition* for receiving stimuli. This is the first, absolutely essential act in all selection. Try to imagine a creature which could not respond selectively to anything. In some serious diseases of the thyroid, the victim attends in a helter-skelter fashion, swiftly shifting from one thing to another. He cannot keep his eyes on any one object long enough to analyze and interpret it.

In order to sense one thing more keenly, we must inhibit all other sensing. As we concentrate on one, we become dulled to everything else at the moment. When we read an absorbing book, we are more or less deaf to street noises.

But no single moment of attention endures for more than one or two seconds. Attention is always shifting. Useful attention shifts from one point to another within the field of interest. Useless attention wanders afield; there is no inner connection between things attended to.

There are two types of attention: primary and secondary.

Primary attention is purely sensory. Here energy is burned up within the sensory nervous system, and we respond to stimuli from without, such as a noise, cry, or bright light, and from within, such as hunger, thirst, or a sore thumb. In every act of primary attention, the sense organ involved generates and uses energy, but in amounts so tiny that measurement by the most delicate of instruments is still impossible. Even so, tiny differences may result in total insensitivity of some sense organ (as in certain types of blindness) or in some painful hypersensitivity. People differ enormously here. But one's sensitivity never correlates with total bodily energy. Many people of tremendously high general energy may be dull of hearing or sight. Thousands of frail souls see, hear, taste, smell, and feel with enormous keenness.

The hypersensitive person has difficulty in controlling energy leakages. The slightest sounds or faintest lights may stimulate his sense organs so powerfully that controlled attention is impossible until the stimulus has been removed, or finally adapted to.

A man whose sense of smell is far keener than that of the ordinary person may attend to the task at hand with perfect concentration as long as he senses no increasingly intense nor momentarily unfamiliar odor. Let the faint smell of cooking or gas from a passing car seep

through to his nostrils, and he is aroused like a shot. His concentrated attention ceases abruptly. If he can adapt to the odor, the disruption is not serious. Otherwise, he must seek another odorless environment, or remove the disturbing stimulus.

Both Joseph Pulitzer and E. W. Scripps were plagued with terrific hypersensitivity of hearing. Both had to spend much of their time on their yachts, as far as possible from sounds of any kind. They would insist on all motors being stopped, every engine shut off. Neither could sleep while stimulated by the slightest sound. Pulitzer went so far when travelling as to send a secretary ahead to each town he visited with instructions to engage every room above, below, to the right and left of Pulitzer's hotel room. Thus only could he finally manage to sleep.

The energy with which you respond to primary stimuli determines your interests far more than most people suspect. Hypersensitivity often contributes to great interest in and success on a job which turns the trait to useful account. The man of hypersensitive smell, for example, might well become an expert coffee taster. For this job requires an acute sense of smell. Interest in colors is chiefly a matter of eye sensitivity. Artists see them more vividly than do ordinary people. Weak sensitivity greatly limits the field of attention and interest. A very near-sighted person tends to become in-

terested in things seen at short range. He often enjoys reading or microscopical work more than people of normal eyesight. A man somewhat deaf inclines to be interested in few social contacts, simply because he finds it hard to follow conversation.

In many important though often unsuspected ways, the energies of primary attention are closely related to those of secondary. Primary stimuli may or may not induce secondary attention. Here we turn mind and body jointly to a situation, a body of facts, a problem, or whatever may be involved in a primary stimulus. We use not only our sensitivities, as in simple acts of hearing, seeing, tasting, and so on, but bodily and mental energy whose volume, quality, and direction of flow we try to adapt to the demands of the situation. Energy in secondary attention is released in a much more complex and patterned manner than that of primary attention. We inhibit energy in some fields and release it in others. Our success here depends on the prompt and appropriate relief of tensions which are set up in every act of attention.

TENSION AND ATTENTION

Tensions are impulses to do something, though often we do not know what. Every stimulus releases energy, however little. If we direct our energies toward the object or situation stimulating us, we relieve the tensions. But if we

can't identify the tensions nor recognize the stimulus, we feel vaguely discontented, confused, or restless. Thus with many restless women whose energy is aroused by many stimuli which they do not recognize, and who do not find appropriate release from tension in managing their homes. They are plagued with chronic discontent largely because they are impelled to do *something*, but for the life of them they don't know what. So they sit around and feel unhappy.

Sometimes we know the cause of the tension but can't relieve it by direct suitable action. Then we seek a substitute. This may be good or bad, depending on its consequences. Suppose, for instance, that you are insulted and angered by unfair criticism from your employer. He accuses you of lying. The situation arouses terrific tensions. You can hardly hold your tongue and control your fists. Under ordinary circumstances, you can't act directly and strike him, as you are moved to. You have to do something else. You can resign your job, but then the breadline awaits you. Or you can continue the argument. This only prolongs your rage. Or you can walk off and get back to work. This you decide is the most sensible course. You work off your steam and relieve tensions in an extra spurt of toil. Eventually you cool off. Here you have achieved a moderately good substitute.

Tapping energies is an art that cannot be divorced from the relieving of tensions induced by cravings such as those involved in rage,

fear, love, curiosity, pity, and simple eroticism. Attention is normally dominated by these tensions. We always tend to direct eyes, ears, and other sense organs toward things which can (in fact or in erroneous belief) serve to break down the unpleasant tensions. Only after cravings have been satisfied is the organism relatively free to attend to purely pleasant and exciting things in the spirit of free play or in esthetic detachment.

Hence it follows that peak performance can be maintained only by one who has mastered the art of relieving himself of all the tensions of rage, fear, love, curiosity, pity, and simple eroticism as fast as they arise and in the most natural manner possible. Instead of striving to beat down the appetitive impulses, such an efficient person reverses the process. And an enlightened society encourages this way of life. For in the long run it gains most from the free flow of energies.

ATTENTION PATTERNS

No matter what the situation, you tap your energies best *by attending only to those objects and situations arousing tensions which may be relieved by direct, prompt, and effective action.* This is why you must learn to select the focus of attention with such care. But the focus must always depend on your own native energy

pattern. The latter manifests itself in attention in three important ways:

1. The relative volume of your energy discharge, or what we may call *strength*;
2. The *scope* of the focus of attention, which may be either a simple or complex object or situation;
3. The *speed* at which your attention shifts effectively.

These three are independent variables. Any one may appear in any degree with any form of the other two. So there are thousands of individual patterns of attention. All may be broadly indicated in the eight extreme types of attention:

1. Strong-complex-fast;
2. Strong-complex-slow;
3. Strong-simple-fast;
4. Strong-simple-slow;
5. Weak-complex-fast;
6. Weak-complex-slow;
7. Weak-simple-fast;
8. Weak-simple-slow.

The earlier in life you discover which of these eight types most nearly describes your own natural behavior, the more likely you will be to organize your energies appropriately, hence selecting interests which, when attended to, you can easily follow through.

If, for example, you are constitutionally of the strong-complex-slow type, there are cer-

tain kinds of important enterprises in which you may profitably engage, but there are also others which are barred to you. Charles Darwin is a case in point. More or less of an invalid, his mind and body both moved in a leisurely fashion. Yet he naturally attended with enormous energy to complex objects and situations. So he had to work for years to reach conclusions in a field where haste would have been fatal.

There are, of course, many special varieties under each of these eight classes of attention. Theodore and Franklin Roosevelt and Lloyd George show the same variety, the strong-complex-fast. Another kind is found in the juggler who can keep six balls in the air while he drinks a glass of water and jigs. He must have exceedingly strong-complex-fast attention in dealing with visual moving objects. But he does not need the kind of ability we find in a good statesman; he need not carry in clear focus masses of figures, names of people, analyses of current events, and the like.

Many brilliant but plodding scientists are of the strong-complex-slow type; so, too, are expert golf players, whose skill depends more on strength of attention and keen analysis of the position of the ball and the stick required for the next shot, rather than on sheer speed of striking.

Lack of space prevents illustrations of all eight varieties. In the fifth class you find a few mathematicians, like Henri Poincaré, who

attended for brief, swift spurts with weak energy discharge to problems of baffling complexity. The feeble-minded illustrate the eighth type. They attend with weak energy discharge to extremely simple objects and shift attention with difficulty.

Now you see why so many psychologists use so many devices for testing a person's attention. They know that all mental life is rooted in the behavior pattern of attention. You see, too, the importance of selecting foci of attention which harmonize with your energy pattern. We like things to which we attend easily. Dissatisfaction and boredom often result from disharmony between one's natural attention type and the kind of attention required by an activity.

DOMINANCE

In which directions do your energies flow most naturally? Answer this question, and you can answer the larger one about the most effective control of your energies. For what we call your dominant traits can always be analyzed into systems of energy streams flowing in certain directions. As Charles M. Child first pointed out clearly in his highly original hypothesis, "The Physiological Foundations of Behavior," "the point of primary excitation is the region of primary dominance." Does this sound obscure? It need not, for it is really simple and direct. All it means is that the source of

strong impulses prevails over the regions of the body into which these impulses spread. A blast of dynamite which shatters windows a mile away dominates the situation for the moment in the elementary sense that the air waves of the explosion move from a central point outward and set up changes in things roundabout. The things do not, *in the same sense*, set up changes in the initial explosion.

A dominant impulse, we might say, gets the jump on things around it. By gaining an advantage, so to speak, it holds its lead over them, just as the football team which, by a violent spurt of well-concentrated aim, crashes through its opponent's line and pell-mells through for a touchdown. Often victory is a matter of a fraction of a second rather than a matter of greater power. Watch the boxer. He dominates his adversary quite as much by striking more quickly as by putting more power into his punches. Free flow in straight lines wins out over blocked flow and flow in devious paths.

Woodrow Wilson, Warren Harding and Herbert Hoover all failed lamentably as national leaders simply because each in his own peculiar way was unable to maintain dominance in important crises. Franklin Roosevelt succeeds primarily as a result of his easy dominance over people and affairs. Just what does this mean? Wilson could not assert himself in open conference; so he withdrew and thought all alone, reaching decisions which failed to reckon cun-

ningly with trends and wishes. Harding was easy-going, soft, and a moral moron: so his clever, strong, corrupt friends got the jump on him simply by telling him what to do in a compelling voice. Hoover was somewhat like Wilson in that he could not turn on his energies effectively in the presence of strong men who differed with him. But where Wilson was unable to do this mainly because he was a semi-invalid with a diseased ego, Hoover failed chiefly because he was too easily vexed and even enraged by opposition, sometimes to the point of speechlessness. Furthermore, Hoover must have been dimly aware of his own limitations as a leader; for he always inclined to turn over every decision to a committee or to a national conference—and straightway to drop the matter. This form of “passing the buck” is manifestly one odd sort of self-subordination, not a manner of dominance. It is a half-frank surrender of leadership, sugar-coated with the sweet name of “socialized group action.”

Franklin Roosevelt always acts dominantly. He gathers advice and information from all quarters. While doing this, he is openminded in the finest manner. But as soon as he reaches a conclusion, he takes the reins firmly, issues orders, and brooks no opposition. The time for the opponent has passed. The hour of action has arrived. Action is a discharge of energy. Masterful action drives straight and true. Even when it leads to mistakes, men respect it be-

cause they understand that it is much better to put all one's energies behind a wrong decision than to wobble feebly all around a right one.

THE THREE DETERMINERS

Your energy flow varies with changes in three major forces: the quality of the stimulus, your own energy habits, and the momentary tensions demanding prompt relief. The weaker any one of these, the stronger are the other two, relatively.

The weaker the stimulus, the stronger relatively are habit and momentary desire. If, for example, I am asked to do at noon a task that doesn't interest me anyhow, I resist undertaking it; for at noon I am hungry and usually eat lunch. The hunger tensions are far more insistent on prompt relief than the mild tensions aroused by feeble intellectual interest. My noon-lunch habit, too, is stronger. Hence, if I do the work, I do it with weak interest and attention.

If you use your energies in a hit-or-miss fashion and have few well-organized habits, you will be dominated more by the stimulus or momentary desire than by your habits. Children and adults of inferior mentality attend to very simple stimuli, and shift their attention from object to object without any strong inner direction of their energies and interests. They lean on an outer directing force. And "they want what they want when they want it."

Finally, the weaker your momentary desire, the stronger are stimulus and habit. You have few impulses to relieve strong momentary tensions. If you are neither hungry, nor thirsty, nor otherwise moved by some craving, you are easily dominated by stimulating objects and situations, and by habit, whether good or bad. People who have everything they want either pursue each passing novelty or else stick in their comfortable rut.

The problem of attention is chiefly one of energies so well-organized relative to the task at hand that we use no more energy than absolutely necessary to achieve good results. To establish effective attention habits, then, we must eliminate as far as possible everything that interferes with the straight-line transmission of energy.

III

How to Deal with Disturbers of Attention

What are the chief disturbers here? They are both inner and outer. How deal with them? I can give only a few illustrations here, for the trick varies from situation to situation.

Unless absolutely necessary, never attempt to adjust to *extremely intense* disturbers. Never work when very hungry or thirsty or upset by any physical ailment. It is simpler to turn your energies to the prompt relief of resulting tensions. If hungry, eat. If thirsty, drink. If you can't attend to your job because of a cold in the head, take stern measures to recover from the cold. Do not delay one minute! Noble attempts to let mind control matter are a foolish waste of time and energy.

The same rule applies in most cases to extremely intense outer stimuli, such as the deafening noise of a rivetting machine or a dazzling light. Many people have much trouble in paying attention to what they are reading because they read under excessively bright lights. The pupils of the eye contract, and muscle tensions are set up in eyelids and face which cause fatigue, pain, and headaches.

You attend to reading best, so far as light is concerned, under indirect lighting from a fixture so constructed that the opaque under-surface is indirectly illuminated with a not-too-high candle power lamp. Direct light rays should not enter the eyes. If the rays are brighter than the object viewed, you feel eye strain.

A glare on paper interferes with attention while reading or writing. Never use glossy paper. You read best the white type on dead black paper. Next best is black type on lemon yellow paper, which reflects much more light than white paper under ordinary conditions of illumination.*

Attention in the face of similar intense disturbances is usually impossible. Either remove the offending stimulus, or flee from it.

Faint stimuli, too, arouse attention easily and powerfully. As a rule, you adapt to them more easily than to those of high intensity. Usually they leave you with a more or less pleasant feeling. Sometimes they disturb you seriously. Minor eye muscle tensions caused by slight astigmatism often upset you completely. Probably there is no muscle tension in the entire body which, relative to its magnitude, sets up such enormous disturbances as minor eye strains. If these plague you, go to an oculist, of course.

* For a fuller discussion of the attention factor in reading, see "The Art of Rapid Reading." New York. 1929.

Faint outer stimuli interfere with attention much more than one might suppose. These you can usually learn to adapt to quickly or to ignore. You are mildly annoyed, let us say, by two whispering gossips sitting behind you in a movie theatre. Usually good manners prevent your moving away from these insects. Nor can you have them ousted summarily. So you must learn to focus your energies elsewhere. Here practice makes perfect. Its technique we shall soon discuss.

Energy directed toward one's inner states rather than toward the environment seriously diverts attention to the job. Day dreaming blocks straight-line transmission. This tendency is characteristic of many neurotics. The healthy, well-adjusted man's brain is run by the environment almost entirely. He seldom thinks of his inner states. He hardly knows that he has a body. His organs intrude on his thoughts and acts only when they are diseased or starved or injured. Not so, however, with the neurotic. His higher nerve centers are under interminable bombardment from his own insides no less than from the outer world. So his attention oscillates between the two sources of attack. The weaker his mental controls, the more thoroughly these two streams of stimulation blend in his mind. When he dreams, half of the content of vision comes from the organs, and half from the environment.

The straight-line discharge of energy is

most economical. The healthy, well-balanced man learns to attend to that field of the environment that immediately concerns him. If disturbed by mind-wandering, he takes himself in hand and puts himself through a severe course of sprouts, whose fundamentals we shall soon show you.

To organize good attention habits, work hard and spend much energy relative to your own level the minute you undertake any task. Everything worth doing at all is worth doing well. And easy beginnings make hard endings. He who invests little energy in mastering an art or a plan will have to spend much later. This is an old, old rule in business no less than a philosopher's maxim.

Failure to observe it has caused millions of young Americans to grow up half-baked, misty-minded, and provokingly incompetent. Our schools have regarded themselves as greenhouses in which delicate little flowers are encouraged to unfold their tender petals, emit their perfume, and then—be cut off and peddled for funeral cortèges and wedding corsages. Educators have called this blossoming "the unfolding of the personality." Starting with the essentially correct belief that men do well only what they are interested in doing, they distort the thought into an absurdity: they permit the young to work at a task only in so far as they are momentarily interested *in working*.

INTEREST

Plainly, to be interested in a subject is not the same as to be interested in working at it. And to be interested in working at it is by no means the same as to be interested so deeply that one masters it step by step. There are a thousand and one levels and intensities of interest, ranging from the most superficial interest in looking at and enjoying the spectacle up to a profound, persistent, highly technical interest in doing a difficult task.

No matter what your interests, you must work hard and persistently at them. The higher your energy, the more strenuously you must make it work for you. Here in large part is the explanation of the remarkable achievements of that apostle of the Strenuous Life, Theodore Roosevelt. "I am only an average man," he said, "but, by George, I work harder at it than the average man." No average man, of course, could ever have worked so hard as the ebullient Teddy, nor could the average man have spread his efforts over so many fields. Many a man with magnificent energy wastes quantities through haphazard or dawdling beginnings. Do one thing at a time, and that hard and well.

Thus, though man cannot, by taking thought, add a cubit to his stature, he can do something more wonderful and more useful. He can, by taking thought and learning the

art of attention, add an hour to every sixty minutes of his waking life. This is the ultimate magic of mind, that he can augment his personality and multiply achievements in the dimension of time, though not in those of space. Work always increases the aptitude to work provided you follow your own natural lines of interest and ability.

BOREDOM

Lack of variety interferes with good attention. Variety multiplies your powers. Do any single thing to the exclusion of everything else and you soon do that thing badly. Boredom overwhelms you. The more intelligent and energetic you are, the worse you are bored. You try to escape the irksome task by wriggling, yawning, looking around and day dreaming. All this is a leakage of energy running to waste for lack of a proper outlet.

Boredom has been called the gravest menace of civilized man. I protest. It is a menace only to the uncivilized. Anybody who has learned how to make the most of his energies, his time and his money will seldom be threatened by this gray monster. But the badly educated man will. He lacks proper variety of interests or perhaps some social or economic freedom in pursuing such. Above all, he has not been trained in versatility of work and play.

The well-trained man sinks into the

morass of boredom chiefly as a result of some obscure lowering of his energies; and it is this fact which warrants my discussing the subject here. It falls within our scope of inquiry only in so far as it can be dealt with by some technique of energy tapping.

Almost anything that throttles down the flow of free energy or interferes with the volume of normal reactions can contribute to boredom. When it becomes hard to exert oneself in the manner called for by the pursuit of a genuine interest, then the discomfort that results from effort spreads over into the field of the interest itself and insidiously corrupts it. How prevent this? There is only one way, and that is to seek the cause of the energy slump.

Are you suffering from some decline in the previously adequate flow of hormones? Have root abscesses in your teeth started to poison your blood? Is some other more obscure focal infection undermining you? Or is it nothing worse than one of those diffuse tensions that started in some emotional upset? Look closely into your recent moods. Be your own psychoanalyst.

Every shift of attention is a shift of tensions. Every shift of tensions breaks down (more or less) the bad effects of the previous tension; hence it is good. When complete relaxation is impossible, shift attention considerably. This will prove to be a second best scheme for keeping fresh.

The most effective way of shifting attention is to shift attitudes. Suppose you are seated next to a bore at a dinner party. Manners forbid your leaving your seat or ignoring the fellow utterly. In a few minutes his dull drone has exhausted you emotionally. You feel all worn out. How refresh yourself and still remain within the pale of etiquette? Change from your affable compliance and your "ah, yes! Indeed?" and like remarks to an aggressive tone. Ask the bore all sorts of questions. As soon as he has finished a sentence or two in reply to one, hurl another at him. Then count the number of questions required to floor him. After this has failed, take a scientific attitude. Become curious about something, be it in the bore's topics or manner or dress or perhaps in something else at hand. By the time you have investigated everything, the party will be over; so out into the cool of the evening you go, again a free man.

Hundreds of times have I pursued this simple method. And I can truthfully say that I have never been bored for more than a few seconds at a stretch. Hard though this may be to believe, it is a fact. I can recall only two or three occasions in my life when boredom has persisted long enough to become obnoxious; and then conditions were peculiarly adverse to the unnoticed use of this escape mechanism.

Always have on hand many projects at which you can work when the spirit moves, or

when you need a change. Most people fail to do this. I know scarcely a score who follow this sound psychological rule. All the world moves in narrow grooves; work at the office, then golf, then bridge, then the movies, then a weekend party, and maybe now and then the Best Seller and a popular hit on Broadway. Beyond this dulling treadmill nothing! No wonder that mental fatigue sets in early. No wonder boredom haunts the sleepless pillow!

To make the most of your energies, you must tap them through the greatest possible variety of outlets. This is the inexorable law of variety. No man can prescribe for another here; one's variety is another's monotony, of course. But I venture to say that, if you have had sufficient intelligence to earn a degree from any first-class college, you probably ought to try out at least a score of simultaneous projects ranging from something fluffy like detective stories up to something beyond your powers like higher mathematics or portrait painting or walking the slack wire. You should arrange your affairs so that all these undertakings may be dropped and resumed at will, without too great disturbance of your day's work. For instance, I have often recommended to business men that they transfer part of their home libraries to their offices and dip into their favorite books between conferences. Most business executives' sessions would be improved by this procedure. They would get more out of

themselves, hence more out of life. If they doubt this, let them study the lives of interesting and successful people. Here's a fair sample.

D. H. Lawrence was extraordinarily resourceful and versatile. Hence, says Aldous Huxley,* "one of the great charms of Lawrence as a companion was that he could never be bored, and so could never be boring. He was able to absorb himself completely in what he was doing at the moment; and he regarded no task as too humble for him to undertake nor so trivial that it was not worth his while to do it well.

"He could cook, he could sew, he could darn a stocking and milk a cow, he was an efficient wood-cutter and a good hand at embroidery, fires always burned when he had laid them and a floor, after Lawrence had scrubbed it, was thoroughly clean. Moreover, he possessed what is, for a highly strung and highly intelligent man, an even more remarkable accomplishment: he knew how to do nothing. He could just sit and be perfectly content. . . ."

Never allow your attention to be disturbed by disorderly or inadequate tools for the task at hand. You waste precious energy every moment you are distracted while you search for a pencil, a knife, or a misplaced dictionary. Every such disturber not only shifts the focus of attention, sometimes seriously, but requires additional energy to "get set" or

* "The Letters of D. H. Lawrence." New York.

warmed up to the task again. Many people have only their own slovenliness to blame here.

If the conservation of human energy is a high moral duty, then the lowest circle of hell must be reserved for the sloven. No animal lower than he, none more destructive to civilization and to the happiness of our race. For the person who misplaces things, leaves tools lying on the ground, takes a machine apart and fails to reassemble it, washes his hands in the kitchen sink while it is full of dishes, throws newspapers and old letters on the floor, and scatters cigarette butts in his wake regardless of place and time probably makes other people use ten times as much energy as he has to consume through his entire worthless life.

Several times in my checkered career I have been compelled to associate with complete slovens. I have refrained from cutting their throats only by shifting my interest to a statistical study of the time, energy and money required to replace and repair things which the slovens had dropped, broken or left in places where somebody was injured by their unexpected presence. For one full month I kept an hourly record of one alleged mechanic, and I would have continued the research but for the fact that an infuriated foreman kicked him off the premises. Roughly calculated, this arch-sloven, this genius of dislocation, caused other workmen in the shop to spend more time picking up after him, finding tools he had mis-

placed, and repairing damage caused in one way or another by his slovenliness than the sloven himself put in on his job! In other words, the company lost his full time and services through his slovenliness. So everybody gained by his sudden departure for parts unknown.

Slovens cause damages far greater than those brought on by rats. Hundreds of thousands of dollars go up in smoke every year simply as a result of some sloven's tossing a lighted cigarette or cigar over his shoulder and heeding not at all the spot whereon it alights. Other millions crash in automobile accidents for which slovens are to be thanked. Scores of people die because slovens mix up the bottles and pills in family closets. Other hundreds perish because slovens neglected a leak in a gas pipe. Is it to be marvelled at, then, that we look upon Sloven as Satan? The enemy of Cosmos, of course, is Chaos. Cosmos means order, system, form; Chaos is the lack of all these. Sloven has no sense of order, system, or form; so he must be the devil! Anyhow we ought to treat him as Public Enemy Number One!

IV

Rules of the Transmission Line

You have seen how the volume and pattern of energy determine and are determined by the stimuli and foci of attention. You have also learned the chief disturbers of straight-line energy transmission.

The rules of attention must vary with each situation. Hence you must be your own disciplinarian and teacher. You must also evolve your own best methods in learning the first essential, the development of well-organized habits.

No matter what the situation, however, you must be able as far as possible to start and stop energies when needful. Your energy channels are built so that the flow of power is from the environment to the brain *via* the sense organs, thence to the endocrines and muscles. So the following principles appear in the starting and stopping of your energies, hence in each act of attending or failing to attend.

Each person has his own peculiar motivations. You must discover what gets you under way best so that, when necessary, you may

press your own buttons. Here are the most general rules:

STARTING YOUR ENERGIES

The most wholesome and natural starter for energy flows is something outside of you, whether it be something that you see or hear or smell or fear or wonder about or what not. Your environment is the natural object toward which you direct your energies, whether it be in the simple acts of getting food, air, and drink, or in such complex activities as getting people to vote the Democratic ticket. Thus your most effective energy stimulus is some phase of your environment which causes you to set up new adjustments.

Some people are stimulated well by the presence of others. Many cannot work at all unless alone.

Solitaires and Group-Workers

Find out, early in life if possible, whether you tap your energies better in the presence of other people or better alone. Having discovered yourself thus, arrange all your study, work and play accordingly. Few people are neither stimulated nor inhibited by innocent bystanders, and still fewer by spectators or listeners who try to help or to hinder their activities. The rest of us fall into two opposed classes, more or less pronouncedly. One man

plays the piano divinely when alone but cannot stumble through the simplest tune before admiring friends. Another is indifferent and even sloppy when alone at the keys, but brightens and sparkles if somebody asks for a melody. The two tendencies seem to be less marked in simple muscular activities and much more so in mental. That is, people are not greatly better or worse when walking or running or lifting weights in the presence of others; but they are greatly affected if they have to recite lessons or speak pieces or perform calculations before an audience.

Test yourself repeatedly with each type of work from the crudest up to the most difficult intellectual sort. Then scheme to use your energies under whichever set of conditions prove best. You may find that you do heavy muscular work best in a group but think and learn intellectual matters best alone. Or you may do everything better when alone—or quite the reverse.

If you incline to be anti-social, you will probably discover that you get your best results when working alone, especially when thinking and writing. If your mind works slowly and your energy fund is normal, you will accomplish most in group activity, not alone.

Working under Orders

It is one thing to use your energies as you like, and quite another thing to allow some-

body else to turn them off and on as he likes. The man who is his own boss seldom encounters the difficulties into which the hireling runs every day of his life. Tapping one's energies is much simpler than having them tapped to order. This brings us to the toughest problem of the modern factory system. We cannot solve it here; it drags us into a thousand byways and snarls us up in all kinds of psychological puzzles. But a few fundamental facts and principles must be lined up for your inspection.

One of the ablest students of shop efficiency methods remarked, after two and one-half years of investigation, that he did not even hit upon the key question of his inquiry until the latter had been ended. He had been recording the rate at which some 40,000 employees worked, wearied, grew more or less efficient, developed boredom and day dreaming, and in general shifted their attitudes toward their jobs. When the task was finished, the specialist learned that he ought to have concentrated on quite another question, namely as to the effects which right and wrong methods of supervision have on the workers' effectiveness and morale. Coming at the problem afresh, he quickly learned that the worker's attitude toward his job, his boss and his own domestic conditions influence his output, as to quantity and quality, more than any other single factor. Except where home affairs are a

mess, the worker's attitude toward his immediate supervisor is most influential. His attitude toward the job itself is distinctly less important.

The boss who tries to get the most out of his gang by setting a stiff pace and by bawling out the slow workers ends up with an output far below that of the boss who cheerfully explains to each worker in his gang just what the job is, how each person can get the most done by resting often and relaxing and practising the easiest ways of doing the job. Companies intent upon cheap production must learn this lesson soon—or perish. Satisfied workers are better workers. Better workers leave jobs less often, so that labor turn-over drops, thereby reducing shop costs greatly. I believe that, as the huge, unwieldy corporations of the past quarter-century slowly disintegrate during the next decade, the smaller businesses that will take their places will find it much easier to handle workers like human beings, simply by virtue of the personal contacts facilitated by smallness.

While the necessity of working under orders which are only half understood and often given in an obnoxious manner continues, the wise worker will make the best of a bad situation by pursuing two general policies. First, he will so plan his activities off the job that they yield him the greatest possible satisfaction. Secondly, he will practise a special form of relaxation on the job with the single

purpose of becoming either indifferent to its unpleasant features or compliant toward the job so that he learns as much as possible about it without trying to dominate either situation or his immediate superior. Just how to perform these tasks depends upon the job and the shop. So we cannot go into further details here.

Be Your Own Self-Starter

If everything in the way of an environmental stimulus is lacking, try to start your energies at the next step—the brain. Build up thoughts and attitudes which touch off your endocrine centers and your muscles. To do this, you must have a plan of action. Obviously, you can't get under way if nothing in the environment moves you and if your brain as well fails to stimulate you.

Nobody can help you here. The best we can do is to show you a few ways of eliminating vagueness and indecision that block the flow of energy and hence confuse your thinking and attitudes.

After getting into the clear as to how you wish to use your energies, work out the details.

But, say you, I can't do this. Well, let us see if there are not a few tricks of compelling yourself. Here are three which many people have tried with good results. One man writes out his resolutions and posts them where he cannot fail to read them every few hours. An-

other man goes further; he tells his friends what he is going to do and just when. He repeatedly talks about his plan thus, so that his friends come to expect performance on schedule. Thus he is shamed into following through. A third man goes the limit. He enters into solemn commitments with people. They expect and demand performance. This stimulates him enormously. He has, in a sense, surrendered his own weak will to the will of others.

This last method is the surest. It may be used with variations. Suppose, for instance, that you truly wish to develop yourself as a public speaker, but find yourself distracted by other interests. Take steps to deliver public speeches. Once you have been scheduled to appear, you find it hard to back out; and the pledge acts as a sharp spur.

If thoughts and attitudes fail to stimulate you, as a third best bet (and a much poorer one), try exciting your emotions, such as your fear of your losing your job, if you don't get to work on time.

I do not want you to infer from this that it is possible to develop energies merely by the act of taking an attitude of full-fledged, red-hot emotions. Nor is this necessary. The only important thing is to get something started which, being antagonistic to the previous trend in other muscles, establishes an energy flow. A tiny irritation can, if properly nursed, break down a much greater urge.

STOPPING YOUR ENERGIES

To stop your energies and check useless attention, follow the same rules in reverse.

First, cut out from your environment whatever stimulates you. Sometimes you may have to flee the environment. At other times you may be able to stay in it, but merely cut out some part of it. If your office desk is beside an open window through which disturbing street noises pour, close the window.

If people disturb you, and your job demands close association with them even though they interfere with your attention and economy of energy, hire a secretary to guard you against all but the most necessary personal contacts. Schedule all appointments. Or lock the door against people except those you expect if you have no middleman. As a rule, people of low energy must barricade themselves thus from all but the most imperative engagements, for they gain in effective work what they lose in informal good will.

If you cannot escape from outside disturbances, try to work on the next stage in the cycle—namely, your brain. You do this in the first instance by shifting attention away from the undesired influences from without toward certain thoughts, interests and plans. I have often had to work in a noisy room while writing articles. Merely by drilling myself to attend to ideas connected with the articles, I have

usually escaped from outside sounds and sights.

If you have difficulty here, train yourself somewhat as follows. Force yourself to do hard mental work under the most unfavorable conditions. Above all, work as hard and as fast as you can. Learn to study, read, and reflect on your work while many distractions nag. Work for an hour or two each day in rooms where other people talk, a radio or phonograph plays, children chatter, and chaos reigns. This is difficult, I know. But keep at it until it becomes fairly easy. This is mostly a matter of muscular skill. Eliminate all unrelated actions, such as raising the eyes, cocking the head toward an encroaching noise, and so on. When you have finally mastered this art,* reverse your procedure. Then work in the best possible surroundings, undisturbed and quiet.

Check every impulse to attend to your own inner state while dealing with a practical task. Keep your eye on the ball. Keep your mind on the next movement, whether the latter be of your hand or of your reasoning. Alternate action and rest so that as many muscles as possible are relaxed at each interval between efforts. Do not misuse the rest intervals in introspection and revery.

The least effective procedure is again indicated when you find it impossible to cut off undesired outside disturbances. This third

* For a fuller discussion, see "The Art of Learning" and "The Art of Rapid Reading."

method is to start up the proper emotion for stopping the activity. It is peculiarly difficult because it is in the nature of an emotion itself to induce activity. The method becomes possible only by virtue of the circumstance that antagonistic activities are mutually exclusive. You often wish not to stop all action but merely to stop certain lines of action. Then discover which types of emotions will so interfere with the undesirable lines of action as to inhibit them. This is perhaps a little confusing at first thought. But see how it operates in escaping boredom, again. You shift your inner attitude toward the bore or toward the situation that becomes boresome. Sometimes this becomes possible by a change of attitude and emotions such as shifting from the masterful emotion aroused by trying to argue some stupid question with a bore to the attitude of curiosity, in which the bore simply becomes another bug under the microscope which you intend to study. Now your tensions are completely changed, though, to be sure, just as many muscles are involved, numerically speaking, in the development of curiosity as in the aggressive act of trying to beat down the bore's arguments.

BOOK III

WORKSHOP

I

Overpowered and Underworked

Man has built up, through the ages, a huge fund of physical energy with which to maintain himself against the hostile forces of his environment. He possesses more than three times as much, for each pound of his body weight, as any other mammal which has yet been measured. For each pound of flesh in a horse, cow, dog or cat, there is considerably less driving power through adult years than there is in five ounces of human flesh. (The exact ratio seems to be about 2: 7.75, according to Rubner.)

But even this great advantage has not satisfied man. He has developed cunning devices for the better use of his energies. He makes a calorie go much further than any other animal can. His brain and his endocrine glands make this economy possible in many ways, some of which have been described here. Above all other devices must be ranked his skill in logical analysis and mathematical calculation; for out of these have arisen all the technologies of modern chemistry, physics, and engineering. Tapping energies outside of his

skin has become one of our chief passions. It ranks with the tapping of inner energies and has made much greater progress during the last century than any other technique. The Technocrats have recently been massing statistics to show the millions of slaves which the engineers have added to our working population in the form of generators and motors. Nobody pays the slightest attention to the Mayor of New York City when he pushes a button in his office and starts a big factory running in Detroit or touches off a huge blast of dynamite on some dam site in the Rocky Mountains. Such energy controls are commonplace. We are, however, just beginning to take notice of a serious complication growing out of such prodigies of energy tapping. We see it is subtly changing—and perhaps aggravating—the technique of tapping man's inner energies. Here is how it works out.

Scientists and inventors develop ingenious mechanisms for tapping physical energies in coal, petroleum, wind, and water. Profit-seekers adopt these and sell them to consumers. In time the widespread use of the inventions saves a tremendous amount of labor. Hence people use up less and less of their inner energies on their jobs. Incidentally the same tricks of labor saving are applied to the activities of play—and even of physical exercise. A good talking machine enormously reduces man's efforts to hear good music. The radio reduces it

still further. The whole world of events and opinion is brought to one's bedside at a turn of a dial now—this being already a commonplace. In a single generation the energy consumed in common labor has dwindled by fully one-half, while that consumed in the most popular pleasures has declined perhaps by at least 25%.

But babies go right on being born with the same million-year-old pattern of energy equipment. By their twentieth year, those who weigh 150 pounds have nearly 53,000,000 calories of reserves to be used up to the day of natural death, while those who weigh 200 pounds have about 70,000,000 calories. In normal work and play only a small fraction of such energy can be used nowadays. But the ancient urge to use it persists; and, if thwarted, some trouble flares up. People therefore seek new outlets. This appears in a restless striving toward new excitements and ever widening variety. And this induces profit-seekers to make and sell all sorts of novelties, each one of these being designed on labor-saving lines. The outlets for energy increase in number, but the volume of energy each discharges declines; so that little improvement in man's situation results. At the same time, many ways of using up much energy have become either impossible or difficult for the city dweller. Automobiles crowd the highways and make walking a discomfort if not a dangerous sport. Horses are too rare and too expensive. The city boy finds no place to

play baseball. The clerk, growing stiff on his stool, craves tennis; but he must travel five miles from house to court, and that is not easily managed with regularity. So what happens?

Nervous ailments multiply as never before in history. The Mayos have reported that one-half of all the beds in American hospitals today are filled with patients suffering from some kind of nervous breakdown or disease. In New York State alone five people are sent to asylums every four hours of the twenty-four, year in and year out. Insanity, suicides, crime, perversions, and milder upsets increase with every passing season. Cults, fads, and quackeries arise to serve those who seek outlets but have not yet broken down. Observers who see only the surface of events often attribute all this to the ancient Puritanism of New England. Nothing could be further from the truth. The greatest single influence in turning America into a madhouse and a den of degenerates has been the money-maker's peddling all the labor-saving devices to a people sprung mainly from robust pioneers who were accustomed to use their big muscles fourteen hours a day outdoors. No doubt the outcome will be a finer civilization. But the price we pay is pretty stiff—millions of shattered creatures poisoned by pent up forces.

Nobody has hit upon a method of releasing normal energies within the flimsy walls of a city flat nor under the whirling shafts of a

great factory whose every effort is to lighten the strain on muscle. Even love life is largely thwarted by the cost of living and the insecurity of jobs in an industrial order whose so-called leaders understand nothing about its management except in so far as their personal profits are concerned. And sensory existence is perturbed by shrieks, groans, squeaks, rumblings, screechings, whistling, and all the rest of the urban pandemonium, which upsets many a stomach almost as much as the ears.

The shrewd man, finding that such an environment cramps his style by braking his energies, arranges his affairs so that, for a good part of his working year at least, he lives in a more wholesome place. Few well-to-do New Yorkers spend much time in Manhattan outside of the unavoidable working hours. The ruling classes of America all live mainly in distant suburbs or in the country as much as possible.

What, though, if you can't move out to live, work, and play as you like? Most of us can't. We must accept our neighborhoods and associates pretty much as they are. The adjustment grows more difficult daily. For today we are caught in the bitterest struggle for existence of this generation. Most of us are opportunists perforce. For the next few years in America, the average man must live, not by free choice, but by whatever good chance comes along.

Never before was it so important for you to operate your motor at peak efficiency. Hence our next problem is to survey the workshop. Here you stand or fall by your own efforts on the job. An automobile motor may fail from any one of a hundred or more structural weaknesses or poor design. Man may fail from any one of thousands. He is enormously more intricate than an automobile. To make his task still worse, hundreds of his flaws cannot be seen nor heard nor felt by himself or by a lay observer; and many others cannot be spotted, even by the best specialists, with high reliability.

There is, however, one common symptom of workshop trouble which anybody may readily observe. It indicates that something is being done wrongly, perhaps in any of a thousand ways. We call it fatigue. We recognize it in many forms and through many signs, such as increasing clumsiness, mind-wandering, a slowing down, drowsiness, and so on. So, before we pass on to the details of the workshop, we may profit by a bird's eye view of this broad maladjustment to jobs.

II

Outwitting Fatigue

Most people fall into the habit of judging a man's energy by the frequency and ease with which he fatigues. But nothing is more misleading. One of the most revolutionary discoveries in psychology is that lack of close connection between the loss of energy and the sense of weariness or revulsion, accompanied by muscle pains and headache and sometimes nausea, all of which men call "fatigue."

There are two kinds of fatigue which have little to do with each other. One is physiological, the other psychic, or what we commonly call "brain fag."

Physiological fatigue is a toxic state brought on by the failure of the body to slough the waste products of muscular effort fast enough. Carbohydrate is the primary fuel of the muscles. This forms glycogen in the liver. And whenever you move your muscles, they burn up some glycogen. There is left over—somewhat like ashes, so to speak—lactic acid which, in some manner not at all understood, stiffens the muscle fibres. During hard work, the amount of lactic acid in the blood rises

steadily and the muscle fibres cease to react. That is exhaustion. When the worker ceases his efforts, the lactic acid spreads through all tissues in contact with the blood stream. A. V. Hill reports that as much as 3 grams per second may be liberated in the muscles of a powerful man, while his entire body can endure the presence of 130 grams. During rest, the lactic acid is removed by recombining with oxygen and eventually becoming glycogen again.

When a voluntary muscle is forced to contract rapidly and often, it lacks time to recover. So its power declines steadily. The accumulated toxins quickly disturb the highest integrative functions of the brain. Observers usually report that the tired person first loses his interest in whatever he is doing and then tends to become irritable or moody, according to his total condition at the moment. His motions lose their nicety, firmness and precision. And if he is employed in a factory, he is in grave danger of catching a hand or foot in a machine or walking into an elevator shaft. Speech deteriorates likewise. Slips of the tongue increase and various petty automatisms develop to vex the weary one.

People vary greatly in the speed with which they can clear their systems of this enemy of work, lactic acid. Individual differences among people doing the same kind of work are as great as 300%. An athlete in trim

will recover from exhaustion in six or seven minutes after strenuous exercise, while a sedentary person, put to the same task, may not come back to freshness in twenty minutes.

Seldom does recovery spread over twenty minutes in most kinds of normal hard work. One is about 90% recovered in six or seven minutes, according to A. V. Hill. As the process of eliminating lactic acid goes on continuously, a man need not stop for rests in most occupations except just after spurts of effort; and then it suffices to pause for two or three minutes. Nothing is gained by longer rests.

Both bodily and mental fatigue have one factor in common: most, if not all, cases are brought about not by loss of energy but by some difficulty in integrating all the impulses and drive of the personality around the exhausting activity. We grow weary in body and mind as a result of what we may call one-sided conduct. When some segment of ourselves stands idly by while other segments work, or when such a segment is prevented from functioning by these working parts, impulses and tensions are set up that break down our coordinations. We feel fatigue. And fatigue is a protest against monotony, for monotony is the *local exhaustion* of some nerve tract which, as it loses its own tiny fund of energy, induces disturbances throughout the body. This exhaustion favors the shifting from the reactions of the nerves of one sense organ to those of an-

other, from one set of muscles in reaction to another set. This guarantees a steady variation of behavior in which no segment of ourselves is worked at the expense of other segments.

Fatigue is like sleepiness and falling asleep. It is a preservative mechanism—sometimes a restorative, too. It is a protest against monotonous functioning which, as Sherrington has keenly pointed out, is a danger in the ordinary environment. In a world that shifts and changes every moment, the creature that rebels against monotony briskly thereby increases its own chances of survival.

Fatigue of body alone often occurs without any mental weariness whatever. Mental fatigue, however, occurs both independent of and in conjunction with bodily weariness. In the strict sense, "brain fag" always accompanies some slight muscle fatigue, since the very act of attending involves muscle tensions, however slight.

When we feel "brain fag," we experience the temporary failure of escape from stimuli and reflexes which have developed to the point of interfering with and even suppressing a host of others. Mental fatigue is the first step toward an escape which as yet cannot be consummated. Like sleep, it is no mere decline in energy. We have seen the tiny fund of energy required for hard mental work. Why, then, should most people be so weary after a little thinking? The explanation throws light on

the whole problem of tapping your energies. *It is not the burning of body fuel that exhausts us and produces feelings of fatigue. It is either muscle tensions set up by acts of attention to the mental problem or else it is boredom and a feeling of futility directed toward the task.*

Were mental fatigue no more than a decline of energy, we should expect the human body to behave more or less like an engine that begins to run out of fuel. We should look for a sudden slowing down and then a quick stop. A man reading a book would, in that event, go temporarily blind; or, if it was not his eyes which ran out of power, then it might be his brain, in which event he would become unconscious. And he could not resume his book until he had assimilated some food.

But this does not happen in ordinary mental fatigue. There is little or no connection between the feeling of discomfort, the unwillingness to go on working, and the ability to pursue fatiguing labors. Long ago William James observed the phenomenon of "second and third wind" in fatigue, a problem which we shall soon take up. Since James' time others, notably Thorndike, have conducted experiments which show that a normal man can carry on any mental or physical activity within his ordinary range of power for several hours at top speed, and at the end of the period be performing his task as well as he did at first. When he feels fit and enthusiastic, he achieves results

which are no better than those attained when he feels weary, disgusted, irritated, or bored, *provided he really tries to make the best possible showing when he is fatigued.*

All this, of course, does not imply that there is no connection whatever between energy and fatigue. It means that it is much slighter and more localized than is generally supposed. Extremes of energy affect one's capacity to integrate and hence play a part in determining the time and conditions of fatigue. A man of extremely high energy can keep going at a distasteful task longer than a weakling can, assuming that both men show the same degree of integration, more or less. Likewise a healthy man can continue unpleasant work more successfully and for a longer period than a man in poor health.

BAD HEALTH AND FATIGUE

Bad health, indeed, makes one susceptible to fatigue more than any other single factor. Does this seem obvious? It's not. For, fantastic as it sounds, thousands of people in need of prompt medical treatment don't even know there is anything the matter with them. Constantly fatigued, they blame the job, not the power plant.

Here are one thousand men employed as clerks, bookkeepers and the like in Cincinnati offices. In 1929 the Heart Council of Cin-

cinnati * gave them physical examinations. Of all subjects, only six were physically sound. Two hundred and thirteen had minor ailments. Seven hundred and eighty-one had major defects. And though eighty per cent of the group needed medical care, *seventy-two per cent didn't know there was anything wrong!* Or if they did, they failed to report their defects to the examiners.

One year later, another thousand male factory workers were examined. Here only four were for the most part healthy. Minor defects afflicted 160; 836 had "severe impairments likely to influence their length of life and their work capacity"; 965 needed immediate medical care, and *eighty-eight per cent of them didn't know they were in any way abnormal.*

This sampling of two thousand workers is enormously significant. Most of them were subject to fatigue which greatly interfered with working efficiency. But remember that working conditions in large cities like Cincinnati are on the whole more healthful than those of most smaller localities. The environmental factors of the groups studied, therefore, were probably more favorable to reasonable health and efficiency on the job. Furthermore, the Cincinnati survey is large enough to indicate a similar ignorance of ordinary hygiene among the huge majority of American workers.

Even the young workers were in poor health. McCord estimates that fully seventy

* As reported by Dr. Carey McCord, l.c.

per cent of those under thirty are hampered by major physical defects; nearly a fourth have minor defects; and *ninety-five out of a hundred would profit by early treatment.*

The afflictions, of which most were unaware, remember, varied from flat foot to sinus trouble. Nine out of ten had dental defects other than fillings and minor infections. Only eight per cent reported having had dental attention within the year. Seventy-three per cent had eye trouble. Thirty-six per cent were flat-footed. Thirty-seven per cent were over- or under-weight by twenty pounds or more. Forty-six per cent had respiratory defects, including sinus trouble and enlarged tonsils. And so on down a long and melancholy list.

Why recite all this? Simply because it demonstrates that the average American worker is so dull of sensitivity that he doesn't even know when his power plant is badly out of order. He has to be told when it balks and stalls and fails to run smoothly.

He economizes on medical care only to pay in the long run a price far dearer than the cost of prompt attention to major defects in his power plant. Here you may protest that the last four years have left you without cash enough for food and rent, let alone doctor bills. To which I answer that you may visit any good doctor or dentist, explain your financial situation, tell him the maximum amount you can afford for treatment, and, if he cannot take

your case himself, be referred either to some other doctor or to a clinic for the care you require.

Unless you are piggishly healthy, make it a rule to have a physical examination every year. And regardless of your health, visit your dentist every six months as the schoolbooks tell you to. *Keep your power plant in first-class order. Never economize on it.* There is no economy so stupid as that of ignoring the first principles of good health. And none of the latter is so obvious and so neglected as that old saw about the stitch in time.

The poorer your health, the more susceptible you are to fatigue. Likewise the converse is true. I can confirm these facts amply from my own experience. Taking as par 100, the healthy city dweller has a hæmoglobin count of about 90. Any drop below this is likely to reveal itself in some disturbance of energy. When my own count went down to 86 once, I was unable to shake off a light cold; I had serious stuffiness of the ears; I was digesting food slowly and with some distress; I disliked reading anything through to the end, unless it was very important; and my physical fatigue was so great that for long periods I was totally unable to talk for more than a few minutes at a time, while when writing long hand I found myself dropping the last letters of words. For weeks the slightest exertion fatigued me out of all proportion to the effort.

COMMON CAUSES OF FATIGUE

Study well the relative importance of the common causes of fatigue among shop workers, as observed by Rexford B. Hersey in his interesting investigation of "Workers' Emotions in Shop and Home." * Apply his findings to your own personal problem.

By a special weighted method which need not be explained here, Hersey ranks the fatigue causes as follows:

Outside activities; that is, things done out of work- ing hours either for pleasure or for social ends,	1,040
Physical activity on the job,	517
Emotional tension,	430
Bodily tension,	287
Mental activity,	237
Colds,	200
Malnutrition,	133
Boredom,	121
Physical environ- ment; that is in its unpleasant, de- pressing, or other- wise exhausting aspects,	119
Climate	110
Unsuccessful effort	100
Too much sleep	49

* University of Pennsylvania Press, 1932. Especially see page 110.

Far and away the most frequent cause was "outside activities"—that is, things done in leisure time for pleasure or for purely social purposes. They caused fatigue more than twice as frequently as the next most important factor—physical activity on the job.

How easily this can be confirmed in the sorry records of students, housewives, athletes and would-be artists. Over and over I have watched promising youths arrive at college portals, make a fair flash of a start as freshmen, and then imperceptibly slip behind until, after a year or two, they have joined the mighty ranks of obscure mediocrity—if not the inglorious squadrons of the flunked. Tear aside the veils of privacy, and you behold card games until two in the morning, dances, petting parties, whoopee after the big college games, joy rides, movies, week-ends in the country—each taking heavy toll in the form of calories and hiding the debit side of the ledger with a pretty smear of pleasure. Say what you will as to the value of all such experiences—and I admit that a fairish case may be drawn up for the defendant—the fact still remains that the one ultimate asset of life, energy, has been squandered.

Turn to the elders, and you find a still stupider picture. They arrive at work worn out from the previous evening's late bridge or drinking bout and carry on through the day in half-hearted interest and easy exhaustion.

Many a worker past forty does not realize the heavy price he pays, too, for strenuous exercise in evenings and week-ends. The older he is, the more he should pull in on games and exercise which drain his energies heavily. After forty, he should give up tennis, and play golf only moderately if at all. If greatly fatigued by any more or less strenuous exercise, he should give it up at once.

Sensible people need few tips on how to reduce fatiguing outside activities. The duller your evenings, the better you sleep. The better you sleep, the more consistently efficient your work. Need more be said?

The rest of these causes of fatigue we discuss in their more general aspects throughout this book. It is your business to study them not only in relation to yourself as a worker, but in all your activities. You must, of course, learn how to rest and relax. But before we embark on that phase of the action-rest cycle, we must first look at the phenomenon of "second wind."

You have probably often experienced complete exhaustion followed by a curious return of energy which many people believe a case of tapping "hidden reservoirs of energy."

III

"Untapped Reservoirs"

That famous doctrine of "man's untapped reservoirs of energy" was first expounded by William James. And now we must expose its serious errors. Though we agree that most people fail to make the most of their energies, through lack of insight and discipline, we cannot accept James's view, as summed up in the following oft-quoted passage from his essay, "The Energies of Men."

"Men the world over possess amounts of resources which only very exceptional individuals push to their extremes of use. But the very same individual, pushing his energies to their extreme, may in a vast number of cases keep the pace up day by day and find no reaction of a bad sort, so long as decent hygienic conditions are observed. His more active rate of energizing does not wreck him; for the organism adapts itself, and as the rate of waste augments, augments correspondingly the rate of repair.

"The normal opener of deeper and deeper levels of energy is the will. The difficulty is to use it, to make the effort which the word volition implies. But if we do make it . . . it will act dynamogenically on us for a month. . . .

"The best practical knowers of the human soul have invented the thing known as methodic ascetic discipline to keep the deeper levels always within reach. Beginning with easy tasks, passing to harder ones, and exercising day by day, it is, I believe, admitted that disciples of asceticism can reach a very high level of freedom and power of will." *

Here are two fundamental assertions, both inaccurate. First, energies may be tapped at will. Secondly, when you tap them, you can go on using them indefinitely. Nowhere in authentic records is there the slightest support for either idea. I have never yet seen a person who rose to new heights of activity except under conditions which do not fit at all James's hypothesis.

What happens in the case of the successful tappers of energy is quite simple. They give up various activities which have been using much energy and divert the latter to the new ends. In the second place, they learn how to make each unit of energy go furthest. Thus the illusion of tapping deep and unused reservoirs is created. Nowhere can this be seen more clearly than in those ambitious and intelligent persons of low energy such as James himself or Gamaliel Bradford or Immanuel Kant.

At bottom the procedure of each is the same. All activities which do not serve the

* In "Memories and Studies," pp. 232, 250, 251.

dominant ambition are suspended. The most exhausting naturally go first. They are usually social—evening parties, debates, the working out of important projects with other people not wholly likeminded, and the managing of institutions. The energy thus saved is next nozzled down to a fine, strong stream and directed into channels where a little of it accomplishes much. Most often the preferred course is predominantly intellectual and draws but lightly upon one's powers; remember that the energy in one salted peanut suffices to run a first-class mind for a couple of hours at purely mental work!

If the intellectual ability is lacking, then some exceedingly simple set of attitudes or pseudo-ideas becomes the object of fixation, while the coarse efforts are suspended, as before. Thus with the Yogi, whom James parades as his model. True, the Yogi does succeed wonderfully in a certain kind of relaxation and narrowing of activity—all of which is excellent. But it is absurd to say that he taps new reservoirs of energy. Fact is, he does not burn up nearly so many calories as a common laborer; and a high school teacher, in the course of her day's duties, probably consumes more than fifty cultists who, in best Yogi fashion, look at their noses, breathe slowly, sit motionless by the hour, speak to nobody and keep their minds blank. In all the annals you will find not a single well-authenticated case of such people achiev-

ing anything comparable to the deeds of voluminously energetic men. True, they often deceive themselves into thinking that they are doers. But let their works speak for them.

IV

"Second Wind"

What happens in people of fairly high energy who become exhausted and, shortly afterward, experience "second wind"? The physiology of the process is somewhat as follows: Each motor nerve reaching a muscle attacks the latter through its own special channels. The incoming neural current sets up metabolism there, and as the muscle is exercised, various chemical changes and decomposition products upset the local equilibrium so much that further reactions are impossible. This is the moment of complete muscle fatigue. But this condition, it now appears, is confined to certain tracts—or perhaps to certain chemicals—of each muscle fibre. If a different stimulus invades the latter, a fresh response occurs at once.

Does this not furnish a clue to "second wind"? You start off on a long walk over level ground. You hold your pace evenly, moving always in the same stride and manner. Soon you weary. Instinctively you change your stride. You may even walk faster, or trot, or run a little way. And lo! You have caught your "sec-

ond wind." You have tapped a new level of energy. By will power? By some mystic Yogi trick? Not at all! Simply by bringing into service a different set of integrators which switch off the old, worn motor nerves and switch in a fresh set. Remember that, when you move in one stride, you integrate your muscles in one pattern; and hence through a different set of spinal and cortical centers: and when you change to another stride, you integrate in another pattern, hence through the medium of some other centers. And, as in a kaleidoscope, a tiny change in the grouping of the elements involved in the integrative process develops an enormously different new pattern of action.

It seems likely, too, that "second wind" can be brought about in another way less favorable than the one just described. You are, for some reason, compelled to continue an activity without any marked variation of pattern; the work itself may be operating a machine in an automobile factory, every motion restricted to a nicety at every instant all day long. You must keep moving monotonously all day long and, perhaps, around mid-morning, begin to fatigue. The work becomes hideously distasteful; your mind wanders toward pleasanter things, your eye deserts its objective now and then for a fraction of a second. Suddenly something goes wrong. Your fingers do not make quite the right contacts; a piece of metal gets jammed in your machine, and you have to execute some

rapid emergency moves to save the apparatus from wreckage. This changes your stride by the very mechanism of fatigue itself. And here we see how the mind-wandering that is a well-known feature of all fatigue serves once more as a defense mechanism and also as a means of freshening you up by forcing a shift of action.

Least often the "second wind" is gained through a mental process. The routine worker in a factory, wearied by monotonous moves, may, as he fatigues, think of the disaster that will befall him if he does not keep plugging away at his dull job. He depicts in fantasy the wife and children going hungry and ill clad because he is out of work. He sees himself going from factory to factory seeking a new job and always failing because his last employer refused to give him good references, as a result of his botching his work when fatigued.

Now these random trends of mind are not so random as they seem; they are driving, *not always individually but as a mass*, in the direction of extemporaneous substitutes for the detested routine movements. And the livelier the worker's fantasy, the more probable the eventual upwelling of an adequate substitute. Some path of free association finally links up with the spinal nerve trunk which attaches to the motor nerves that have not been functioning in the routine work; and these fresh nerves now send their currents into the muscles. "Second wind" is now complete.

I have no doubt that there are many other channels over which shifting nerve currents may bring the same result to pass. The all but infinite complexity of the human nerve system makes that virtually certain. The tapping of "hidden reservoirs of energy" is not a whit more "spiritual" than the tapping of a keg of beer. A few more decades of research will, I suspect, enable us to see in the varieties of these double and triplex mechanisms of action the marks of some familiar types of personalities. Today the best we can say with safety is that *ease and rapidity of alternation in behavior bring with them an immense increase of effective energy, and hence that variability in motor action tends to make for "strong" personalities*. "Strength" here means, of course, the power to achieve desires. It has no moral implications. Weak personalities, on the other hand, are most often those which, *failing to fatigue easily and being sluggish in fantasy*, persist in monotonous behavior and hence, if they are poorly endowed with energy, soon break down or, if they have power aplenty, get nowhere with it or at least not very far. The "greasy grind" in college is such a specimen. So is the outwardly successful small business man who has won financial security by sheer plodding in one position.

If, then, you would learn to tap your energies to overcome certain types of fatigue, remember that you do not need new energy.

You merely need a new approach to the available energies. Your body is like an engine with a dual ignition system. Each cylinder contains two sets of spark plugs. But only one set is used at a time. When it becomes fouled by over-use, the engine begins to miss fire. Then the second set of spark plugs is switched in, and now your engine runs smoothly, on precisely the same supply of fuel as before. The throwing of a tiny central switch is enough to produce this immense improvement. No fresh fuel supply is tapped at all. All that is needed is an easy alteration of cortical activities. Cultivate a flexible attitude of mind which, at its best, we call open-mindedness. Then train yourself in versatility. Again and again we harp on this point. And we shall have still more to say about it later, when we study practical ways of economizing on energy.

V

An Open Mind in an Open Body

Behind the grotesquely oversimplified teachings of Coué I find deeply buried a priceless technique of tapping energies. Once or twice Coué came within an inch of uncovering the treasure; yet, after a careful reading of his brief essays on autosuggestion, I am convinced that he missed the greatest truth of all.

"Do not rely upon the will. Use only your imagination," is the gist of his advice to people who seek health or more power. "Never say to yourself: 'I *will* become stronger and better.' Say only: 'Every day in every way I *am* becoming better and better.'" The trouble with the will is that it sets up violent efforts which serve rather to block the appropriate action than to reinforce it. It is more effective to take the attitude that you are whatever you would like to be; for then you rise above all the struggle and striving of an act of will.

Many critics poke fun at Coué. I do not. On the contrary, I think he comes amazingly close to one of the fundamentals of self-energizing. When he errs, it is because he fails

to push his analysis far enough and, in all too human fashion, he leaps to the airless peaks of whopping generalities. He is entirely correct in his discrediting of the kind of will about which he talks. To set up strong tensions of body is a poor way of accomplishing anything. As we have shown elsewhere, we must first learn exactly which acts carry us forward to our goal most smoothly; *and during this stage we must be compliant toward the situation. We must not be aggressive and self-assertive for the simple reason that we thereby increase the chances of making the wrong moves at the wrong tempo and in the wrong directions.*

Here is the huge advantage of will-less imagining. *We rid our bodies of muscle strains of all sorts. We relax utterly. And in this state our muscles are left free to be guided by the demands of the total situation. They are no longer driven by our organs nor by a segment of the brain.*

It is not to be denied that absolute relaxation is the beginning of the swiftest cures of mind and body alike. But it cannot be attained if the craving which we call a wish is permitted to dominate the muscles. *The correct readjustment of most human ills begins with a curious sort of learning process in which the body as a whole finds itself and sets about its own recovery.* Any good physician will tell you that nine ailments out of ten cure themselves without medicine. What you cannot learn from most physicians,

however, is that the first step in such a self-cure is *to give the body a fair chance by opening all channels of recuperative activity*. Take this literally. The channels are the blood stream and the special organic tissues; all must be brought to the condition most favorable for unblocked activity. Secretions must be free to flow wherever needed; and they cannot do this if some muscles go tense and thereby block the flood of blood or the movement of air in the lungs or the currents that run through the nerves.

It is only *after* the straight line toward recovery has been learned by body and mind that the muscles may advantageously be set in the direction indicated as best. Even then, it is important to alternate freely between action and relaxation. The will is a menace at the first stage of adaptation. Its place is in carrying out a lesson well learned.

VI

When and How to Rest

No more general remedy for fatigue as well as for many diseases exists than rest. Here the normal bodily processes operate without interference of muscle tensions and the resulting spread of accumulated toxins throughout the body. The time and place of useful rest depend, among other things, on health, age, sex, energy, and the type of work. No general rules can be set forth.

All movements of the body, however, cause the adrenal glands to release adrenin into the blood stream, thus causing the liver to release glycogen and the heart to speed up. One minute of such a simple activity as getting up and walking about is enough to stimulate the whole body with adrenin for twenty-two minutes.

Conversely, the inhibiting of bodily motions checks the flow of adrenin and glycogen. Thus too are the emotions of rage and fear prevented or at least minimized. A person who sits absolutely still for long stretches conserves his energies admirably, *provided he is relaxed and not under tensions*. So it is easy to understand why, if his energies incline to be low, he works

out a day's program which allows for many such periods of total rest. He is doing much more than easing up on his muscles. He is retaining in his liver a precious fund of that amazing form of energy, glycogen, one ounce of which, when burned in the body, would lift one ton to the height of 165 feet!

No matter what you do, you tap your energies best by short, frequent periods of rest. These allow prompt recovery from muscular contraction, and from the tiny tensions that occur in mental fatigue. The length of the rest periods should vary with the type of work. But long intervals are extremely inefficient.

Industrial workers doing "light-heavy" muscular work for eight hours a day prove this general law. They accomplish as much in a single day of short, frequent rest intervals totaling about an hour and a half as in *fourteen* days of long, infrequent rests! *

The United States army has long practised this pattern of work-rest cycles. Field regulations for marching infantry require the following procedure, which enables seasoned infantry to march for six days a week as long as necessary.

The men march for forty-five minutes. Then they halt, adjust their packs, and rest for fifteen minutes. Thereafter they march fifty minutes and rest ten for the balance of the day, except for a noon halt of an hour, if possible, when they rest and eat.

* Shepard, "Effect of Rest Periods on Production."

Ordinary people recover completely from fairly severe exercise of half a minute to a minute in twenty minutes of rest, as A. V. Hill has shown.* But nine-tenths of full recovery takes place in seven minutes. And often when severe efforts must be made, even two or three minutes of rest allow time for nearly adequate recovery.

Take a vacation every day. If you do this, you may never need a vacation of the sort people usually take.

The body operates on a twenty-four hour cycle. It cleans out all fatigue poisons (so-called) within the span of a single earth-spin. Waste products are eliminated, and exhausted reserves of chemical energy refilled. Hence it follows that the only rest which a healthy person needs, *so far as genuine exhaustion is concerned*, must be taken within the day's round. If not then enjoyed, you cannot make it up later.

So there is a profound sense in which you ought to live from day to day. It is not the usual sense of the command; it is quite different. Think of your intake and output of energy as a financial problem of making ends meet; then study it as a bookkeeping problem also—as A. V. Hill has done. Remember that, when you arise in the morning, the books must be balanced—somehow. If you have failed to replenish your vital stores, it is only a matter of days before you break down.

* "Living Machinery."

The ordinary summer vacation is a delusion and a snare, in so far as you use it as a rest period. For many people, like myself, it is a detestable—and often impossible—interim of idiocy. The rare and long vacation has a wholesome function for only one sort of person—and that is for the man who is bored by his job or the woman who has lost all joy of domesticity. Emotional exhaustion, to be sure, may demand a complete break with depressing, stale routine. The sincere vacationist is running away from something—it may be from his work, or from his social web, or from himself.

THE ANGLE OF RELAXATION

People differ greatly in the angles at which they relax best. If your margin of free energy is relatively low, you will have a normal tendency to lie down; when it is very wide, lying down causes restlessness.

The slowing down of bodily activity when in the horizontal position produces a variety of effects. Broadly speaking, these manifest themselves first and most strikingly at the point of least energy relative to momentary balance. For instance, two marked types of alimentary disturbances are associated with changes in position after eating. Some persons are cursed with stomachs which respond so feebly and slowly to the stimulus of food because some other part of

the body tends to monopolize its free energy. So before the stomach can function well, the segment monopolizing energy must be partly deprived of that power.

In some people, this dominant segment is the cerebral cortex. They tend to think so actively while eating that gastric reaction is delayed until they have thrown themselves down for a nap. Sleep cuts off energy flow to and from the over-active part of the cortex, and thus enables the stomach to become a new focus of equilibrium.

A reverse pattern appears in other people. If they lie down after eating, their general activity slumps so badly that stomach reactions virtually cease, at least long enough to cause brief trouble. In one man of this sort, his cortex is quite as lively when he dozes as when he is awake and moving about, while his alimentary activity is reduced.

You use up more energy when lying flat on your back than reclining at the angle of a steamer chair. And Amar * finds that the position most favorable to complete rest is lying on the stomach, preferably inclining toward the right side.

I relax best when sprawled in an ordinary chair with legs and feet stretched out in any comfortable position, head and neck resting at a

* "The Physiology of Industrial Organization." Jules Amar. London. 1918.

slight angle on the top of the chair. Often when reading and studying, I relax best of all when standing.

Amar finds interesting comparisons in three erect positions. Two are anatomically symmetrical, one asymmetrical. In the first, the head is up, chest out, the heels touching in the most approved physical hygienic manner. This position, he says, causes fatigue. The "convenient attitude," with head slightly forward and shoulders somewhat rounded, contracts the muscles less and uses less energy than the former position. Best of all, though, is the "easy attitude," which reduces energy expenditure to a minimum. Here the position of the body is asymmetrical. One foot and leg are placed slightly ahead of the other, with knee somewhat bent, hand resting on the hip. The weight of the body is carried by the other foot, the forward limb merely maintaining balance.

GOING INTO THE SILENCES

Perhaps you have laughed at people who "go into the silences" as a regular habit. Laugh no more! It may be that you never need to emulate them, but they have found a useful method of controlling their energies; and if it serves them well, it is silly of you to belittle it.

Many distinguished people, especially those who use their voices professionally, have found prolonged silence indispensable as a habit.

The still remembered prima donna, Patti, always refrained from conversation throughout the entire day preceding an evening performance at the opera. And the even greater Duse almost always kept mute both before and after acting. More than half of the famous public lecturers and orators now in the public eye use this method more or less. Lecture agents and managers have told me that a check-up of practices shows this, and I well believe it; for I know several able speakers who regularly refrain from all talk.

True, individual differences in this respect must be great indeed. There are always freaks like Voltaire who literally live on talk and expand on declamations; they would perish if forced to shut up. Most of us, though, would gain something now and then by exercising stern control over man's greatest enemy, his tongue. Control is hard. No set of muscles succumbs more stubbornly to sustained suppressive efforts than those used in speech. At certain ages children seem impotent here. So do many women and a few men.

VII

Sleep: Some Suggestions

You tap your energies best when you get enough and the right kind of sleep. But what is that? You're the doctor here. I refuse to advise anybody how to sleep or when to take naps. For sleep is a total adjustment of mind and body; and we can understand its cycles only when we know intimately the personality of the sleeper. It is an expression and adjustment of the entire individual, just as are diet and exercise and mental work. Rules are treacherous, if taken literally. Here is one of the weakest aspects of school-taught hygiene today. Those who teach it fail to make due allowances for individual differences. They convert gross statistical tendencies into iron-clad "laws of health."

In his useful little book, "Psychology in Daily Life," Carl E. Seashore tells how the physical director at Yale set him right in the matter of sleep. Seashore had been feeling tired through the day and went to the director for advice. The director told him that a "Christian gentleman always took a nap at noon." Seashore tried it and found that it worked beautifully. He increased his efficiency and good spirits. No drugs nor

diet! Just a fifteen-minute doze! So, with the sincere desire of helping mankind, Seashore passed the glad tidings along in his book. There he suggests the following rule:

“Cut short the long, light sleep of the late morning hours and substitute a short sleep at some favorable time during the day. Fifteen minutes of sleep after the heaviest work and the main meal of the day will count more for efficiency than five times fifteen minutes of sleep in the morning.”

No doubt this is an excellent procedure for thousands of people. They try it and find it is good. But it is madness for thousands of others. Seashore and the physical director do not realize that sleep patterns vary enormously from individual to individual. They do not realize that such differences, while largely caused by infantile and vocational habits, are also rooted in the subtlest of physiological differences, such as the basal metabolism, the individual nerve and muscle tone, and the individual digestive pattern.

The matter is too intricate to dilate upon here. Enough to say that I have found, both in myself and in others whose sleep patterns I have studied, no surer way to ruin the whole day than to take a nap during it. I am not talking theory but bitter experience when I say that my effort to apply the foregoing rule to myself caused me more indigestion, mental depression and general inefficiency during the months of trial than anything else I ever did, save influenza. Out of sixty

days when I checked on the results of the mid-day nap, fifty-four of them found me totally unable to read, think, or do any other kind of brain work for five or six hours after the nap. And some friends who made the same trial had similar, though not so extreme, bad results.

The traditional rule of eight hours of sleep may not fit your case at all. Some people require much more, especially in winter. Many get along easily on four or five hours. Studies of women operators in high-grade factories show that every increase in the length of sleep from five to nine hours improves the workers' output measurably. Naturally, the greatest improvement occurs as sleeping is prolonged from five hours nightly up to seven hours. Odd individual differences come to light here. Some women do worse on six hours' sleep than on five. But all of them do better on seven hours, still better on eight, and best of all on nine. Not a single case has been found, so far as I can ascertain, in which a worker did worse by lengthening sleep beyond seven hours.

On the other hand, Fred A. Moss has shown that normal people can be kept awake from sixty to eighty hours without noticeably reducing their ability to use their wits and muscles, except during the early stages of sleeplessness, when all the forces of habit rally against the effort to do something unusual.

Moss tested his subjects in automobile driving, among other things, and noted that the

crisis came between the forty-fifth and fiftieth hours. Then a man would fall asleep while at the wheel. Once through the fiftieth wide-awake hour, though, he would grow less drowsy and more skillful. In general, this agrees with both common opinion and similar evidence from other tests.

The striking fact emerging from all studies of sleep is this: they prove almost everything and anything. The conclusions and results are so various when not diametrically opposed that only one general conclusion is possible. There are no universal sleep habits or rules, *with the single exception that sleep follows complete muscular relaxation.*

Many people claim to be greatly disturbed by noises. The relation of the latter to sleep has lately been studied by H. M. Johnson and his colleagues at the Mellon Institute. Here are some of their findings.

As with all other stimuli, those which distract are those to which we attend. Many people claim that street traffic, for example, interferes with their sleep. Yet the investigators have found that although street noises are most abated between two and four-thirty in the morning, this is not the time when their subjects stir the least in sleep. Most of them, in fact, rest most quietly between three-quarters of an hour and an hour and a half after going to bed. And their deepest sleep, as a rule, falls during the hours of moderately noisy street traffic. Furthermore, Dr.

Kreidl and Dr. Herz of Vienna have found that deaf people do not rest more quietly than do people with normal hearing.

Under certain conditions, indeed, many people report that noise is an aid to sleep while quiet disturbs it. Thus with many city dwellers vacationing in the country whose sleep is disturbed by the "deafening silence." Often, too, deep sleep seems rather to accompany than to be prevented by increased intensity and volume of noise. In his own case, Johnson found that he slept well while living on an island where the noise of the pounding of breakers and the rustling of trees was fully fifty times as great as that of his usual environment.

Hence it seems probable that noise *in general* has little or no correlation with soundness of sleep. Whether it arouses you or not depends on the type of noise. Whether you are accustomed to it or not, whether you are slightly awake when you notice it, whether the bedding is too heavy or light, and whether the noise has any special relation to your own nature and habits—all this is decisive.

VIII

The Domain of Effort

The technique of tapping energy varies greatly according to the domain of effort. For the domain determines the volume, hence the pace and to some degree also the pattern.

Dealing with "pure ideas," as in mathematics, consumes very little energy. Dealing with ideas in the form of communicative language uses considerably more. Dealing with ideas and people in the form of public speech uses still more. Handling physical objects uses more yet. And handling people directly uses most of all. Most types of work combine two or more of these domains. The hardest job on earth is that of President of the United States. It consumes daily at least 1,000 times as much energy as, let us say, the purely intellectual labors of a book-keeper whose time is spent in adding and subtracting.

No matter what the domain of effort, there is always only one right way while there are thousands of wrong ways of performing every act. Here we come upon one of the most startling and revolutionary discoveries of modern physiology. *That man who does his job best uses*

the least possible energy. This is true in everything from writing a book to running a race.

The best athletes use the least energy in performing their feats. The last man in at a foot race usually expends much more than the first. So too in jumping, boxing, rowing, and all the more dexterous accomplishments. This is not guesswork. Physiologists have proved it by measuring energy output during athletic contests.

Likewise in artistic and intellectual fields. Genius works along with amazingly high efficiency, while the dullard squanders a week over one mediocre sonnet, a month over an essay which might as well have never been penned, a year over a thick book which contributes little to human wisdom, happiness or hilarity. This does not imply, of course, that behind and before such case of accomplishment there does not lie immense training and severe discipline. It merely means that he who discovers the tricks of making the least energy go furthest in a desired direction forges to the front sooner or later.

Have you never heard some ponderous pundit declare that some writer cannot be of much account because he turns out too many books and essays in short order, or that some politician has little to say because he speaks so fluently? I have. And I am always amused because, after pretty careful checking on records, I have found—say nine times out of ten—that, while not every rapid and voluminous worker is

superior, almost every superior worker is rapid and voluminous. Still more significant, though, is the discovery that the superior worker does what he sets out to do with marvelous economy of time and energy. He may toil in a field where volume of output is almost impossible, yet he reveals his high rank in his efficiency.

Very slow workers are ever in peril of mediocrity or worse. A delay between the steps of a complex series of observations or deductions increases the chances of a slip. Some important but faint feature may be forgotten over night. Some sequence learned with difficulty on one day may, if not rehearsed for several weeks, go lost beyond all recovery. A few slow minds are blessed with rare persistence and detailed memory; these overcome the handicaps of the tortoise. But most do not. Beware of them in a crisis! They will fail you.

IX

The Best Way Is the Most Efficient

Study the latest trick of the Olympic runners. It first came to the notice of American coaches in 1924, as they watched the queer motions of that brilliant British contestant, Harold Abrahams. He advanced up the track like a man stumbling and about to fall flat on his face. A sudden violent hoist of his knee barely saved his balance at each stumble. As one observer remarked, he managed to hold his nose to the ground over the entire course. To an eye habituated to the smooth beauty of the classic runner, Abrahams appeared clumsy, ugly, dangerous, and surely ill devised for victory. But the eye is wrong, Abrahams right. The new-fangled stride proves to be the most scientific method of making the most of leg energies. This is why our own Gene Venzke, the Pennsylvania runner who has broken the mile record, has adopted Abrahams' technique, with slight modifications.

Contrast it to the orthodox technique, and you will readily perceive the economy of energies. For generations uncounted, runners have been taught to fling the advancing foot as

far forward as possible with each lift of the advancing knee. Now, what happened? The advancing foot would meet the earth somewhat in front of the runner's body; hence it acted somewhat like a pole in the pole vault over which the runner had to drive his entire weight. In some measurable degree, then, he moved through a series of short arcs. At the beginning of each arc he had to lift himself upward; and every inch in that direction was an inch more or less away from the tape. Or, to put the same thing in simpler language, the foot that met the ground ahead of the body acted as a brief brake to the rectilinear forward motion of the body.

With the technique of Abrahams and Venzke, the leg motion is entirely different. The foot is raised but not flung forward in the orthodox manner at all. Instead, it is allowed to fall back to a position pretty much the same as that taken in ordinary walking. The result is obvious: the moving body keeps ahead of the forward foot, hence it is always falling, while the runner is always lurching forward to save himself from falling flat. In short, the body is catapulted more nearly in a straight line toward the tape, so that less energy must be expended in lifting oneself over a forward obstacle, namely the over-advanced foot. So, here as everywhere else, the best turns out to be the most efficient way.

X

The Most Efficient Way Is the Most Skillful

The most efficient way is also the most skillful. It requires, above all, the right native energy patterns; then a careful analysis of the activity concerned; and finally, enormous practice.

Suppose you wish to become a skilled proofreader. You analyze the job. You find that your eyes and mind must easily cover 7,000 words of text hourly, day in and day out, catching all errors. Hence you study the job of rapid, accurate reading. It requires good eyesight, smooth eye movement, the ability to grasp phrases and even sentences in a single quick glance, familiarity with proofreaders' signs, and absolute concentration of attention.

Next, you practise learning to read swiftly and accurately. You do this spontaneously and unanalytically as you read your paper or scan a magazine. You also practise many exercises in developing good reading habits. You find your best position in reading and stick to it. You practise developing a large vocabulary and drill yourself in spelling. You improve your eye grasp by learning to take in as rapidly as possible

many words in a single glance. You cultivate the art of skimming, training yourself to get the gist of what you read by running your eye in a sort of zig-zag fashion down each column of reading matter.

Finally, you fit the job of proofreading to your native energy pattern. You find, after practice, that you do your best work in alternate periods of, say, half an hour of reading and five minutes of rest. You also read more efficiently if you eat a morning and mid-afternoon light lunch. Furthermore, your mental energies operate better in the afternoon than in the morning. So you adapt your work accordingly.

Thus with every activity, occupation and career. You develop skill only after you know such minutiae about the work and worker, and after constant practice.

Many activities seem to be wholly distinct and to require no single common skill. Often, however, skill in one type of work overlaps with that required in another utterly different activity. A former doctor recently told me how he applied the principles of medical diagnosis to reorganizing a receivership and bankruptcy office. He studied every job, made a list of every unfavorable symptom in organization or method, arrived at principles of reorganization, and finally prescribed the necessary changes in equipment and procedure. His skill in medical diagnosis contributed greatly to his success in the receivership job. Hence he economized on

time and energy, and was highly praised for his achievement.

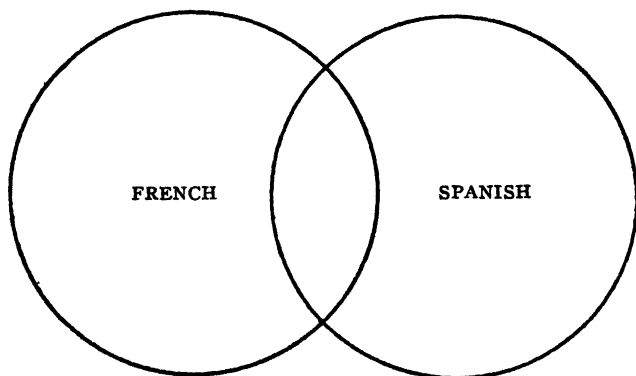
THE VALUE OF VERSATILITY

Cultivate intelligent versatility, and in the long run you economize on energy. This is puzzling, isn't it? Well, here's the explanation.

The versatile man develops habits in many fields. He reads Latin, handles wood working machinery, sails a boat, plays poker, has sold automobiles and phonographs, knows geography through and through, writes passable sonnets when in the mood, and runs a small greenhouse. Each skill deals with matters considerably removed from all others in the list. Now, it is well known that habits can be transferred to new situations in so far as the latter resemble those in which the habits were first formed. Thus, mastery of French aids one in learning Spanish only in so far as Spanish words, grammar, and style resemble French. In this case the aid would prove substantial; but of course the reverse would be true of skill in navigating, for in this there is no single factor that can be found in the use of Spanish. Each skill lies at the center of a field of possible activities. The closer the latter are to the center, the greater the ease of transferring that central skill to them. We might well call such a field a sphere of influence. At its outer edges the activities contain *only one factor*

each in common with the focal skill. This represents the minimum of transfer.

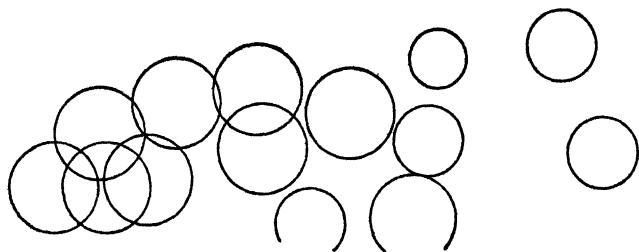
We now see life as a whole somewhat in the design of a galaxy crowded with activities each of which spreads out according to some law like that of the inverse square. We see thousands of these fields overlapping, some slightly, some greatly. The field of French crowds in pretty closely upon the field of Spanish, thus:



But the field of wood working lies far from the outermost fringes of Spanish, thus:



A telescope which could look through the reaches of time as well as space would then reveal the stream of living as a flux of moving fields which, when reduced to a diagram, would look like this:



Now, in the course of a normal lifetime, a man must deal with thousands of situations. He must meet hundreds of people, make innumerable judgments affecting his fortunes, and wake up every morning prepared to encounter surprises. What shall we say then about his chances of long-range success and happiness? Is it not clear that a shot gun with extra wide scatter would serve much better than a rifle? This figure of speech understates the fact; for a habit is not merely a single buckshot flying through space, it is more like a moving electric charge surrounded by its own field of force. It does not have to collide head on with another habit in order to prove effective; its field need only overlap upon that of another habit in passing, very much like a star sweeping past another star millions of miles away.

Very well! The versatile man builds up, let us say, twenty basic habits, each of which has a large field of force. That is, each embraces partial activities which occur in many other forms of behavior. The twenty fields spread over much more of life than any single field can. Hence they enable the man to adjust quickly and easily to many more common situations. His spread of learning is enormously increased, while the quantity of effort for new learning is correspondingly decreased. In other words, he is able to handle at least part of many new situations, as a result of his earlier acquisition of twenty basic habits.

But we still have to consider the most important advantage, which is hard to phrase, though easy to understand. I think we shall call it habit hybridization—a horrendous mouthful but pat. Here is a simple case from life. A man I know learned Spanish as a boy in high school and was so interested in it that he pushed on by himself. To earn a living, he took a course in a business college, where he mastered stenography, typewriting and bookkeeping. When he went forth to find a job, the only good opportunity in sight was with a telephone company in Mexico. Obviously his command of Spanish was an immense aid in getting the post and in keeping it.

Now, it would be foolish to suggest that stenography as an activity overlaps upon Span-

ish. Here we see a different set-up. The opportunity itself was complex. It contained many activities, among them speaking Spanish, writing Spanish, stenography, and typewriting. These unrelated habits had to combine in order to dominate the situation. Thus ever throughout life. The ordinary job is fairly simple; hence almost anybody can qualify for it; hence the supply of applicants usually exceeds the number of jobs; hence wages are forced to a minimum. But the exceptional opportunity is a web of activities, all of which must be mastered. Hence only a man whose previous habits come close to the total web has a chance.

At this point somebody may raise an objection. It may be said that no energy is conserved merely by having a set of skills that enable one to get exceptional jobs. At most the versatile man of this sort is able to get somewhat higher wages than the chap who must stick to the simple tasks with the ability of almost everybody. To this I would reply that, as a rule, life flings just such odd combinations of duties at us almost every week. They bob up in jobs, in human relations, and in one's personal pursuits of pleasure. Many of them must be faced willy nilly. For the common man they are crises. They exhaust him and often break him. When they crop up in the job, they serve mainly to favor the versatile man in the eyes of the paymaster. Earning more money and winning promotion more

rapidly, the versatile man struggles less for bread and butter; he enjoys shorter hours and usually easiest toil, for he plans each act swiftly and surely out of his rich background of diverse habits. So he is less often exposed to defeat, bewilderment, and anger; hence he preserves a healthful poise. He is at one with his larger environment.

The supreme tragedy of American education springs from the lamentable failure of our school teachers to drill pupils in genuine, well-planned versatility. Perhaps no more lavish waste of human energy can be found in the chronicles of mankind than that of the past forty years of consistent, enthusiastic, expensive and thoroughly grandiose mistraining of a hundred million young people. At a cost of more than sixty billion dollars in that period, we have succeeded in raising a generation of incompetent, confused, disillusioned and rebellious adults. The two worst possible mistakes were made. In the first place, none of the basic habits has been thoroughly established so that easy, successful functioning follows; and, in the second place, the habits selected for the supposed versatile spread have been, in the main, petty, pretty, and with few important linkages. Let me be painfully specific.

In the grammar grades few children master the art of reading. Everybody admits that this is the fundamental of all education, for nine-

tenths of all men learn comes to them, in part if not in whole, through reading. It has been estimated that fully half of ordinary knowledge is acquired entirely through the printed page. Hence a child ill trained in this skill goes into the world a mental cripple.

Geography is taught in a most superficial manner, as a rule. History is not taught at all, in the genuine sense; only a few names, dates, and supposedly red-letter events are hammered into the unwilling youth; nothing of the significance of these ever penetrates—if the teacher can prevent it.

Move upward into high school. Here you find the commonest policy to be that of offering the young a taste of this and a taste of that, with the idea that he is merely to broaden his horizons and ascertain, by much sampling, what he likes and dislikes. (There are exceptions to this trend, but they are few.) In order to sample everything in sight, the youth must be offered a very tiny draught from the largest possible number of founts. His days are a clutter of five, six, seven, and even eight courses. He flits from French at nine to European History at ten; then on to Algebra at eleven, to Civics at one, and after all that a couple of hours either in the manual training shop or in the gymnasium.

If any one of these subjects were drilled into the learner so that he became skillful, I should raise no protest. But it is notorious—and

a stale comment—that his French teacher seldom knows French, and his Civics teacher cannot describe accurately how his home town is actually managed. Even his athletic try-outs serve his body ill. He is not drilled in the ways of health and high energy nearly so well as he might be, though I am free to praise many teachers of hygiene and a few athletic instructors for their efforts in this direction. They serve their classes far better than most other teachers.

Most youths come out of high school totally unprepared for a life of pleasure, profit, fame, or fortune. They have dabbled about and become past masters of dabbling—a useful habit in its place but hardly one to use in making a living or developing a wholesome attitude toward society. To make matters worse, the graduates have dabbled at too many things remote from American life and piffling. Of what earthly use is French? I can find not the slightest service in the language for any American of 1933 and after. Nobody uses it. Fewer still will be using it ten years hence. It has a literature which is merely pleasant—and can be enjoyed almost as well in translation. Of what use is Civics, as usually taught? I see no value in it; on the contrary much potential harm, for it is still taught as the “forms of government” and not as a thoroughly realistic account of how politicians and business men manipulate elections, fool voters, pass

laws to authorize lawlessness and to beat competitors.

Well, so one might run on and on with the indictment. But it has been drawn and thundered so often that I desist.

What can you do about it?

Elsewhere I have discussed this in detail.* No matter what your energy, your interests, your job, or your environment, you are always faced with three types of problems.

First, you must adjust to your environment. Here you get food and shelter, air and sunlight, good climate or bad, health or disease, a good job, a dull job, or no job at all. Whether you adapt well or ill, whether you get much or little satisfaction from your environment depends on how well you know the peculiarities of your world. You learn these when you master geography, the first of the three hardy perennials of modern knowledge.

Secondly, you must understand as well as you can all living forms and their ways of behavior. You must get along passably with yourself, your family, friends, neighbors, business associates, and acquaintances. The more thoroughly you study biology and the related field of psychology, the better your skill in dealing successfully with people and other animals, and in managing yourself.

Third, you must be able to interpret your

* "The Art of Learning," especially pages 34-45.

observations and experiences. You must draw inferences, study cause and effect, discover general principles and compute. You develop skill here through learning mathematics.

Of course, as these subjects are taught in schools today, they do not offer the universal overlap I describe. But this is because they are badly taught. The fault lies not with the subject, but in teachers. Geography should be taught as a true insight into all of the influences at work on the surface of the earth. Every well-educated person should understand the manner in which climate, winds, rainfall, elevation, soil conditions and the like determine the relentless course of events. Every war roots in some wretched adjustment between men and their environments. Men struggle with, conquer, or are defeated by these, first of all. If they cannot get food, shelter, and clothing to keep them alive by peaceful means, they take what they need by force. Study the geography of Japan and you will see many of the causes of her belligerence.

Psychology, too, should be taught in terms of individuals, and how people of all kinds behave in different kinds of environments. People should learn through mathematics the practical problems that grow out of man and his behavior toward his environment, and its abstract forms through which we compute, predict, infer, deduce, and arrive at abstract principles which we apply to concrete questions.

Through these three subjects, we learn the five major arts of management: the art of managing yourself, objects, animals, people, and ideas.

XI

A Last Word to the Intelligent

You have now surveyed—and perhaps mastered—the first grand division of Life Planning. Beginning tomorrow you make the most of your energies. And what then?

Have you improved your lot thereby? A cynic may assure you that you haven't. He may tell you what we remarked in the opening pages, that the great Demon, Technology, has shortened your working hours and reduced the energy you must spend in them so that you have a huge surplus of animal vigor which grows more and more embarrassing. Aren't you in a sorry mess, with all your new leisure? And don't you make it still worse by becoming an artist in the use of your energies?

I would have to agree with the cynic, if I thought that you could find no fresh and pleasant outlets for your energies. But are you so helpless? I hope not. But I must admit that altogether too many people seem to be. Hence this last word of advice.

The next step in Life Planning is to cast about for new activities that will make life more enjoyable and more profitable. Some of these will

be pure play, others pure esthetic enjoyment, others a pleasant pottering, and still others a broadening and deepening of your larger interests. I cannot tell you which way to turn here, for I do not know you. You must be your own guide. You must follow your own strongest inclinations. But I can say one thing to you in parting which may throw a fresh light on the problem. *Analyze and plan your leisure precisely as you analyze and plan a career. Beware of thinking of it as idle time. Beware of appraising it as worthless time.* It may turn out to be worth more to you than all the hours spent on bread and butter.

XII

Rules of the Workshop

TEMPO OF PERFORMANCE

Select work whose natural tempo of performance suits your own. A job that makes you keep moving faster than is comfortable is fully as bad as a job which slows you down to the point of irritation. Many occupations have been analyzed with respect to the speeds at which workers must proceed. Look up the records before you choose your career. Telegraph operators and typists have to be much nimbler than workers in rolling mills and blast furnaces. Farmers usually must move at a pace so slow that a high-strung city man would go wild imitating him.

Inquire carefully into the facts as presented by reliable vocational psychologists. If you cannot get the information you want regarding tempo, go to somebody working on the job in question and find out directly for yourself.

Do not think that, because you can hit the pace of a job on a short try-out, you can hold it year in and year out. A fairly prolonged test is the only sure one here.

RULES OF REST

Begin as early in life as possible to form the habit of taking many short rests from your work but no very long rests. In the course of a single day, you may pause for a breathing spell of five or ten minutes at least once every hour or so. In the course of a week, take off two or three periods of four or five hours each for complete relaxation. Now and then, take off a whole day. But beware of long vacations devoted to nothing at all! During such idleness the subtle habits of skill which you have been forming invisibly crumble—perhaps just a little but enough to set you back weeks or even months. All depends, of course, upon the kind of work you do.

In some cases, no doubt, a clean break is necessary. This is especially true of sedentary and closely confined workers engaged in tasks not entirely pleasant and stimulating. If your job is purely a bread-and-butter one; if you dislike it but plug away at it because it is the best you can find, then plainly the general rule laid down above must be precisely reversed. Escape from the kind of work you do on the job as much as possible. The more completely you do this, the better you will be able to handle the hated routine during working hours.

When you stop work for the day, stop all over. Never take your day's duties to bed with you. These make uncomfortable bed-fellows.

There are two ways of dropping work from your mind. One is relaxation, the other is a shift to some totally different activity, either work or play. Choose either method according to your own nature and the particular conditions of time and place. If there is no work nor play you would like to take up after working hours, then relax. If, after trying in vain to relax, find quickly some new form of work or play into which you can throw yourself.

There are many types of people who gain nothing from total rest. In many cases, a profound shift in the direction of energy outlet will accomplish as much as total relaxation, for thus certain systems are rested and others put to work.

If, when young, you are doing pretty heavy work, rest for at least five minutes whenever you begin to sense exhaustion. And if exerting yourself to the utmost, rest more than half an hour between spurts.

If you are between thirty and forty-five, rest from ten to fifteen minutes when weary over fairly hard work; and rest a full hour after each extreme effort.

This rule must be slightly modified according to the weather. If the day is hot, you can shorten the period of rest; and if cold, you must lengthen it somewhat. Muscles recover faster in warm air than in cold.

If you have charge of workers engaged in heavy muscular labor, apply the rule to them;

and you will surely get more done in the course of the day.

Always experiment with yourself to discover the shortest time you require for resting after any hard work, physical or mental. Resting too long is a waste of time.

Find your own best method of resting. It may differ greatly from ways recommended in good books. One man achieves relaxation and rest most deftly by listening to music; another by reading a detective story; a third by taking a long walk; and so on. How find your own best way? Only by trying and testing many ways, of course. Go at this task seriously, unless resting is no problem at all for you.

No matter what your muscular activity, follow two rules. Never exert yourself to the utmost. And never diminish your efforts once you have got going. When you move, you overcome resistance. You may increase this resistance from day to day if you are training yourself for some muscular achievement. But you must never vary the resistance in a single period, for your muscle tensions then vary and are subject to sudden shocks that prohibit their smooth, economical functioning.

Work done under tension is always poor work. Find the source of the tension. It may be a worry. It may be poor posture. It may be a clumsy, ill planned series of movements executed while at work. It may be induced by eye strain or by enforced silence while on the job or by

lack of proper food. Check up on yourself systematically. Don't guess! Having located the trouble, remedy it at once. If you don't, you waste days, weeks, perhaps months. And that is partial suicide.

Worry is the greatest enemy of relaxation.

If you are a chronic worrier, turn most of your folly to good account by always having on hand many jobs requiring physical work. Many women can turn to the wash board, the iron, and the dishpan to escape little worries. If your troubles are serious, do something about them. Any positive action is better than none at all. But stop, look, and listen before you act, except in extreme emergencies.

If you still are victimized by the habit, make a list of everything that disturbs you. Then make a list of every positive act you have made to eliminate each worry. If you have done all you can and still cannot solve sundry problems, forget them by deliberately turning your mind to the demands of the day.

Write poems, epics, sonnets, and psalms about worry. But for heaven's sake, don't make a nuisance of yourself to your family and your friends.

Avoid mental work when thirsty or exhausted. Avoid it, too, when you suffer from prolonged hunger, although moderate hunger due to a self-imposed minimum diet may clarify your mind. Before doing hard mental work, re-

lax completely. And in doing complex mental work at high speed, rest every ten or fifteen minutes.

If your mind is tired, take up some pleasant physical exercise. But if your muscles ache, relax and take up some pleasant mental activity.

If your mind insists upon shifting to some fresh subject, after a spell of boredom or intensive concentration, there is no harm in so doing, provided that you have no eye strain. If your muscles crave to tackle some fresh exercise after they have been fatigued in an earlier line of work, it is not so easy to decide what you should do. All depends on the degree of difference between the former task and the new one. The greater the difference, the less the possible harm of going on to the new task. That is to say, if you have been practising the pole vault for two hours, it would be foolish to tackle the hurdles or the high jump next; but it might be all right to sit down at the piano and play for an hour, even though you use up as much energy over the keys as in jumping. The outlets are totally different; hence the strain of the earlier work is relieved altogether.

Test your own reactions to various kinds of physical effort. Then you will learn how safe it is to start a fresh set of muscles going after one set has become exhausted.

Above all, never attempt to make swift decisions until you have fully recovered from

either physical or mental fatigue. You can trust your judgment in matters requiring prompt conclusion only when your body and mind are fresh and alert.

Study your own symptoms of fatigue, so that you can always stop work in time to avoid overstrain. No two people behave exactly alike when exhausted. So we cannot lay down flat rules here. But there are sundry things to watch. For instance, many people find that, in fatigue, their hands tremble perceptibly when they hold their arms out horizontally for a minute. Try this on yourself. Again, other people flush at the temples. Do you? In extreme weariness the blood often pounds in one's ears. Have you ever noticed this? Certain people detect the approach of exhaustion by a faint nausea. Do you? Many of us can confirm the observation made by Gulick many years ago: "When I am tired," he wrote, "I cannot distinguish between those things which are important enough to keep me at work and those which are not. I only see how many things are undone; and I tend to go on and on." I think this is quite a common reaction, especially among housewives who, without realizing it, walk miles in the course of a day's toil.

Experiment to find out what positions you can hold for several hours at a stretch without fatigue. For example, William Beebe discovered that he could squat on his heels for hours without weariness if his chin rested on his knees, or flat-footed with his armpits on his

knees, or on the balls of the feet with elbows on knees.

RULES OF RELAXATION

Learn to relax. This is just as much of an art and technique as learning to play the piano or to master golf. Few have achieved such useful results in the study of relaxation as Edmund S. Jacobson, who practised first on himself and later on many others.* Jacobson has found that "Whatever the natural propensities of an individual for relaxation, there is always considerably more that he can be taught; just as anyone with a naturally good voice nevertheless improves greatly with proper training."

To relax properly, you must eliminate all tension. This presupposes that you can locate the tension. But most people don't know how to do this. Jacobson believes that when an individual reports muscle tension, he should always be asked, "A tension to do what?" If the subject cannot answer this question, the exact nature of the tension remains obscure. Tensions may occur singly, as in the strain of a single muscle, or in systems, as in extreme anxieties of the neurotic type. Subtle and swiftly changing inner tensions are difficult to analyze through introspection. However, if they persist, they can be studied in terms of their functions. For a tension is always a stress or strain to do something.

* Edmund Jacobson. "Progressive Relaxation." 1929.
By permission of the University of Chicago Press.

Thus the neurotic can always be forced in time to answer the question, "Anxious over what?"

Just as the average worker (and I am tempted to say even the average person) doesn't know when he needs immediate medical attention, likewise the average person doesn't know when he is tense. How, then, can he learn to identify the tension in order to relax it?

Jacobson finds that relaxation is often prevented by too close observation of the muscles, which keeps them tense, setting up at the same time tensions from sheer attention. On the other hand, the tense person must locate the region of the tension. So, says Jacobson, "a happy medium is reached when, with a minimum of attention, the disturbance is located and then relaxed."

The following technique has been used, so far as I know, only with patients under medical supervision. I see no reason why, however, it may not be practised with good results by normal people who are seriously interested in training themselves to relax.

Practise an hour or so every day.

Begin as follows:

Lie on your back, or, if you wish, sit in a chair, with your arms at your sides. Do not cross your legs. The room must be quiet.

Begin making tense the large muscle groups. To bring out the sensation of any one of these clearly, contract the part steadily while someone retards the movement. As far as pos-

sible, keep all other muscles relaxed so that you clearly identify the tension in the muscle you are studying. For example, when the forearm is flexed, the upper arm should rest upon the bed so that shoulder muscles are not in play; the fingers and hand must also be limp. Sometimes it is easier to identify these sensations if you close your eyes.

Practise in this order:

Contract the muscles of the forearm, upper arm, hand flexors, hand extensors of the left arm and hand.

Do the same with the right.

Now contract flexors and extensors of the left foot; then the left leg. Do the same thing with the right foot and leg. Follow the same procedure with the major muscles of the body.

Next contract the muscles that raise the shoulders, then those that bend the head to the right, to the left, forward, and backward. Finally locate the tensions in speech muscles—tongue, lips, jaws, and throat.

At first, you will experience what is called "residual tension." The clinical signs here are the following: reflex swallowing, slightly irregular respiration and pulse, slight activities such as wrinkling the forehead, frowning, moving the eyeballs, winking rapidly, reacting to any sudden noise, and an active mind. The essence of the Jacobson method is to eliminate these. Usually the tension, which may be surprisingly slight, disappears gradually. In many cases, it takes fif-

teen minutes progressively to relax a single part, such as the arm, leg, or foot.

If practice at relaxation makes you nervous, your method is wrong. Probably you are making various efforts instead of really relaxing. *You must never make an effort to relax.*

After you have clearly identified a given tension, practise at inducing it in a weaker form. Weaken it progressively as far as you can.

As your technique improves, you will note the following characteristics:

Your mind is decreasingly active; for thought control really rests on muscle control.

You experience little or no visual imagery. During visual imagination and recollection, delicate electrical methods show the presence of eye-movements or accommodation. Highly trained subjects report that when eye muscles are completely relaxed, they experience neither visual imagination nor recollection. The technique of eye relaxation, however, is too complex to discuss here.

Your emotions die out as relaxation progresses.

Next, practise at relaxation while you are up and at work. This involves selective relaxation. You must learn to do the essentials and omit the non-essentials, make necessary movements and omit all others.

After long experiment, Jacobson is persuaded that "every learning process depends upon the acquisition of certain tensions with

concomitant relaxations." This is evident in most arts. Proper voice placement depends largely on proper relaxation. So do good games of tennis, golf, and the like. So does skill in sculpture. So does dancing, which is ruined by rigid tensions.

Years ago I learned a trick of relaxation which has prevented all strain in public lecturing, talking, and the like. The approximate focus of this is the diaphragm. It extends up into the larynx, and when established, speech is maintained only by very deep breathing. The mouth seems to drop almost entirely out of the picture. It feels lax, while the lips are mere rags flapping in the breeze of my discourse. Listeners say they detect no poor articulation. The feeling of total relaxation often extends up through both cheeks. In this comfortable condition I have frequently spoken for two hours continuously without the slightest fatigue at the end, and have then carried on conversation for two or three hours afterward. At the end of this time, I often have a definite fatigue, which is nearly always broken down by stopping talking and taking a walk.

Learn how to relax on a minute's notice, as most great men of unusual achievement can do. Do not imagine that you accomplish this merely by lying down. Serious tensions persist even then, as you have just seen. Do not expect to master these at the first try. It may take weeks or even months to develop the trick of easing down.

If you drive hard and tend to overwork, using much physical energy throughout the day, try the practice of the busy college president reported by Irving Fisher. He explained his working ability and long life thus: "My secret is that I never ran when I could walk, never walked when I could stand, never stood when I could sit, and never sat when I could lie down."

This does not apply to people whose energy is used chiefly in mental work, and who spend most of the day tied to office desks. In such cases, reverse this rule, especially when you tend toward mental fatigue.

If you must relax quickly, for some special reason, try a tepid bath—that is, one at blood temperature or a trifle below. If this fails to work quickly enough, use—as a last resort only!—some simple drug like beer or bromides. Which drug you use is a matter of personal experiment. Thousands relax best after drinking considerable beer, while others are only upset by it. So too with bromides. Find your own best sedative.

In certain types of occupations, there is no more effective sedative than smoking. For the mild narcosis thus set up leads to the relaxation needed to make delicate adjustments in such work as surgery, dentistry, piano and violin playing. Tobacco is the enemy of energies, but the friend of relaxation.

If you are a pianist, to get complete relaxation of fingers and hands, try Paderewski's

method of soaking the hands in very hot water immediately before playing.

Practise relaxing often. At least five or six times during your working day, either lie down or sit in an easy chair; then relax your feet and hands at first, after which you should relax the limbs. Next relax the throat and eyes. With careful drill you may learn to relax all over in a few minutes. Then you will find that ten minutes in this condition rests you as much as an hour of ordinary sleep.

Experiment with yourself to find the easiest position in relaxing. Nobody can tell you which way is best. Begin the tests when next you go to bed. Watch carefully the relative ease with which you go limp in each of the main resting postures, namely, lying flat on your back, lying on your face, lying on the right side, lying on the left side, and lying curled up on either side.

Experiment with the positions of your arms. Try stretching them out straight beside you, then folding them across your breast, then stretching them up above your head, and finally resting your head on them in cradle fashion.

In connection with each position, make a test with slow, deep breathing. Notice to what extent it speeds up complete limpness in each position. The effect is likely to differ greatly according to position. This may surprise you.

When sitting in a chair, especially while working, see to it that your lower thigh muscles come in contact with the chair bottom through-

out their entire length. Even pressure along them relaxes them best and does not tend to cut off the blood flow.

At the same time, rest your feet on their edges or else on the heels, so as to relax the sole muscles. Some people dislike the tingle that often develops in the soles, but this can usually be overcome simply by attending to one's work. If it cannot, it is possible to adopt another foot position nearly as good. Place one foot over the other so that one ankle rides upon the under one. One foot is thus lifted clean off the floor, while the other one is tilted sidewise and so pretty well relaxed.

Do not misconstrue this rule to mean that you must hold any of these positions fixedly. Shift about somewhat from time to time; but always return to the relaxed position often and remain in it until some slight tension develops.

To relax best of all, you will probably find that it takes less energy to recline at the angle of a steamer chair than to lie flat on your back.

THE ART OF SLEEP

How shall you sleep?

Nobody can tell you. You must be your own guide after many experiments. The best we can do is to offer some suggestions successfully practised by many people. Adopt those that fit your case. Only one general, though still

tentative, statement can be made. Sleep probably follows and is induced by *complete* muscular relaxation, either voluntary or involuntary. Your problem is to achieve this. But how?

Here is the first rule. It probably fits 99 out of 100 cases. Never work hard for at least one full hour before going to bed. Thus you avoid establishing tensions and muscle sets that are broken down with difficulty and prevent complete relaxation. And never eat a hearty meal just before bedtime. Light food, especially fruit juice or warm milk, is good for some people, but pure poison to others. Many a man cannot even lie down for one full hour after eating anything whatever.

Once in bed, practise the technique of progressive relaxation just described.

Don't think that you must slavishly follow the social habit of one single stretch of sleep. You may be better off if you sleep during several periods of two to four hours each through the day and night. Many people are handicapped in their energies merely as a result of the astronomical cycles. Man is not built to fit the solar system!

Don't oversleep. Get up fairly soon after waking; a late morning doze may ruin your day. Why, nobody knows. But many a man spends dull, sodden days simply because he indulges in cat-naps after first waking up in the morning.

Sleep in a wide bed. You thereby reduce

muscle tension. Donald Laird suspects that the narrow bed induces a faint fear of falling out of bed which results in an unconscious holding on, and secondly that it is more likely to be cold because the covers loosen easily. I add a third factor: movements of the body in sleep tend to put the hand, foot, and other parts over the edge of the bed, thus setting up equilibrating reflexes and resulting tensions. Laird believes that a thirty-nine inch mattress is the narrowest that should be used. There are, however, thousands of beds only thirty inches wide, while hospital beds are only thirty-six inches. Many people sleep best of all alone in a double bed.

Beds that are springy, shaky, and squeaky are obviously bad. Laird tested three kinds of springs: very soft, medium soft, and a third "so stiff as to be almost as hard as an ironing board." He found that the softest required the most energy to sleep on, the very stiff spring next most, while best of all was the medium spring.

Find your own best position in sleep. Don't sleep rolled up in a ball; this increases muscle tensions. Nor should you stretch out absolutely straight. Your leg muscles then become tense.

If you are considerably over-weight, don't sleep on your back. This causes pressure of the internal organs on the giant blood vessels in front of the backbone, reducing the blood flow and thereby straining the heart.

Make your evenings dull. Stop working at least one hour before you go to bed. If you tend to lie awake wrestling with your problems, try keeping paper and pencil at your bedside and making notes of these as they occur to you. Reduce to a minimum your evening's outside activities, including the movies, if you tend to be wakeful. If you have difficulty getting to sleep, don't worry about it. Try various experiments to conquer your wakefulness. Some people have found that perfumes or a new aromatic in the bedroom encourage deeper, slower breathing, giving a simple focus of attention and hence helping in sleep. In some cases, even moth balls have proved effective.

If you are often awakened presumably by certain noises, study these. Concentrate on them. Attend to nothing else. Study their patterns. Notice their rhythms. Try to get so accustomed to them in all their phases that through the sheer monotony of regular attention to these you learn habitually to adjust.

Are you troubled with wakefulness?

Then never worry over it. If you cannot fall asleep easily or cannot stay asleep, there is little sense in fretting about it. The harder you think about the whole business, the wider awake you become.

People who have been seriously plagued with insomnia often invent ingenious methods of conquering it, or else they learn how to manage pretty well without overcoming it. For

instance, one man always has on hand in his bedroom several interesting tasks; as soon as he finds sleep impossible, he arises, dresses, and takes up his work. He makes no effort to fall asleep. In fact, he finds it best to try to keep awake and busy.

Robert Drake, the biggest bridge builder in America, was for years plagued with asthmatic spasms, and had to get up every night in order to breathe. Standing at his drafting board in order to ease the spasms, he did his best work in designing bridges and planning manufacturing methods. As he grew drowsy, he would prop himself in a chair and doze. Then he would waken, alert, and ready to work again.

Many people lie awake wrestling with the problems of tomorrow. They cannot put these out of mind. This is a stubborn insomnia, yet amenable to ingenious controls. Some men make a rule of keeping pencil and paper at the bedside; whenever an idea about the problems pops up, they switch on the light and jot a memorandum. After an hour or two, they have dropped their tensions to the point of falling asleep.

If wakefulness persists, try drinking a glass of warm milk, eating light fruit, or some other simple food. Or else take a bath in water between 92° and 97°—about body temperature, but only on an empty stomach.

If nothing else works, try two opposite

techniques; first, that of Coué, and then that of Knight Dunlap. Try saying to yourself as you relax in bed, "I am falling asleep—I am falling asleep—I am falling asleep." Continue this until one of two things happens: either you are asleep, or you are still wider awake. If awake, reverse the engines completely. Get up and dress, no matter what hour it is; start doing whatever most interests you and make a firm resolve that you are going to keep wide awake at it as long as possible.

BE AN ARTFUL DODGER

Dodge all the work you can dodge without interfering with your success and happiness. In working toward your goal—whatever it may be—make each act net the greatest possible results. This has been the way of nearly all geniuses (other than the psychopaths), all executives, all generals, all philosophers and all saints (except the silly martyrs, who threw away all of their energies for nothing at all).

When prolonged, heavy, or tedious labor must be done, do as little as possible yourself. But apply the same rule to all others who aid you. Allow them to arrange their subordinate tasks so that each person exerts himself the least without harmfully delaying or spoiling the results. This alone is intelligent.

Never lose your common sense in interpreting this rule. Do not imagine for a

minute that it means that you must loaf while helpers sweat and crack. It simply means that the shrewdest team work always turns out to be that which allots to each member of the team the special task for which he is best fitted, and to no member a task which, by some clever rearranging, might be broken up, spread over several members, and thereby lightened all around.

MAKE MATTER WORK FOR YOU

Find your best tools and machines!

To tap your energies best, you must make all things around you serve your purposes. This is the discovery on which Western civilization has been founded. Out of it has grown modern technology. In time it will lead us to a civilization infinitely finer than anything yet realized.

To plant a seed in the ground, that food may grow for your sustenance, you may, of course, scratch up the soil with your fingers, punch a little hole, and drop the seed in it. But what if you can get food enough only by planting 100,000 seeds? To do the whole job with your fingers would soon exhaust their energies. So you scheme a better way of using much less of the power reserves. Out of such scheming there arose first the crude mattock, then the spade and hoe, then the horse-drawn plough of rude design, then the -steel plough that turns

deep furrows, and at length such amazing contraptions as the newest soil manipulator which, pulled by a tractor, picks up all the surface earth, throws it against fast spinning steel disks that reduce it to a powder and then spew it forth in a stream singularly like a fire hose.

So in all fields of human desire and effort. The average man sees such mechanisms every day without once thinking that he may, with a little thought, either invent or find ready-made for his own personal uses various devices that lighten his efforts by making each unit of power output accomplish more than it can in and through unaided muscles. I have often referred to the discovery that a difference of seven inches in the height of a drain board on a kitchen sink saves the housewife as much as 10 calories per hour at her dishwashing. In the course of her life she might save as much as 200,000 calories by this trifling adjustment alone! Or quite enough to perform 100 full days of moderate labor!

Be sure to have the necessary tools available and in good order when you need them. Make material things your slaves, not your masters! Teach them to keep their places.

AVOID LOST MOTION

Many kinds of lost motion are petty yet cumulative to the point of becoming serious. Fidgeting, drumming the fingers, whistling

absent-mindedly while at work, pulling the ears or nose, jumping from the chair and sitting down again to no special purpose, playing with a pen or pencil, and all similar activities are seldom to be attacked save on the ground that they make a bad impression and sometimes run counter to good breeding. But now and then we find a person who makes so many lost motions of this type that he definitely lowers his working capacities. To such a one we say the obvious and nothing more: start at once to undermine such behavior. Try both the old method and the new; if you cannot break the habit by direct act of will, try to break it by compelling yourself to repeat the act early and often and conspicuously.

Save energy and wasted motion in even such simple acts as rising from a chair. The best method here, as Donald Laird has shown, is to draw in your feet close under your body, bending your trunk slightly forward. You then rise almost automatically.

Must you lift a heavy weight? Then bending your elbow, raise the hand carrying the weight to nearly shoulder level. Thus you can carry more than half again as much as with your arm hanging at the side. If you must lift a heavy object from the floor, make your thighs do part of the work. Place your feet as close as possible to the objects, bend your knees, and stoop or squat to lift it. When carrying a heavy load on your arm for a long time, place it as

near your elbow joint as you can. Thus you fatigue less easily. In lifting weights like shovels or spades, use your knee as a fulcrum.

Are you a housewife? Then when ironing never lift the iron to a high stand. To lift one weighing five pounds on to a six-inch stand once a minute for an hour requires 150 foot-pounds of unnecessary work! Buy an iron that slides smoothly onto a low rack, or one that stands on end.

More Power to You!

Remember that this little handbook is no summer novel. It is a workbook. If faithfully used, it will serve you well as a training school. From now on, make careful observations of your own energies. Experiment with the methods we have described to step up the efficiency of your power plant, your transmission line, and your workshop. Don't expect to remodel these over night. You may work a year before you notice a great change in your fitness. Master the art of using your energies as you would train yourself to become a first-class tennis player or swimmer. Efficiency in the use of energy is just as difficult to attain as superior skill in a sport or in higher mathematics. Keep this in mind, and you will not grow discouraged.

THE END

APPENDIX

A FEW TRICKS OF SOME TRADES

Here are a few sample illustrations of the best methods of working at common activities with the greatest efficiency. In each case, the procedure should be applied with whatever variations you may need to fit your own age, sex, energy level, and the like. Probably nine out of ten of you may follow these suggested methods almost to the letter.

TYPEWRITING

The ability to use a typewriter saves more time and energy than skilled operation of any other common instrument. Every child over twelve and every adult should know how to type. For the value of typing goes far beyond its obvious uses. It not only develops the basic dexterity of co-ordinating eye-finger and eye-hand movements. It also forces attention upon language, which is a mind-tongue dexterity. Particularly if pursued with a clear idea of developing its extra values, typewriting improves habits of vocabulary, grammar, and clear, precise expression in written words. Young people could probably profit greatly by typing two pages a day of anything at all, provided each daily passage included a different vocabulary and different manner of expression. First, they should type copies of passages from any books, newspapers, or magazines. Then they should rewrite the copy using only half the original number of words, but keeping the main points. Any form of precise writing by typewriter is extremely useful in developing the major skills of eye-finger and mind-tongue co-ordination.

When typing, hold your body upright. Strike the keys lightly and rapidly. Many people achieve easily a speed of six to eight strokes a second. Work steadily and at as regular a speed as you can. Frequent stops waste energy. In ordinary typing, such as copying, learn to do the work automatically so long as you are not trying to build up vocabulary, improve grammar, and the like. Concentration of attention in typing promotes fatigue. Learn the touch system, of course.

WALKING

On a horizontal surface, you progress with greatest economy at about 2.8 miles an hour. This pace, says Jules Amar,* enables an unburdened man to cover 28 to 31 miles a day with a two-minute rest every half mile or thereabouts. When carrying a burden of 44 to 48 pounds, slow down to 2.6 miles. But you get maximum perform-

* "The Physiology of Industrial Organization." Jules Amar. London, 1918. Several of the methods which I describe are discussed more fully in Amar's studies, including his book, "The Human Motor."

ance carrying a load of 99 pounds walking three miles an hour for seven and a half hours daily, resting for two minutes every 650 yards. An adult between 25 and 50 can thus cover an average of 16 miles a day. But if he speeds up to 3.4 miles, he reduces the distance covered by almost half, no matter how often or long he rests.

GOING UPSTAIRS

Walk upstairs at the rate of about a step a second. In carrying burdens upstairs, you accomplish most under the following conditions: carry a weight of 88 pounds at the rate of 1,370 feet an hour. Do this for only seven hours at a stretch, and rest for two minutes after each vertical uprise of 26 feet.

RIDING A BICYCLE

The normal rate of riding a bicycle is also the most economical. Here you pedal 45 or 46 revolutions a minute, and cover 9.94 miles an hour. Be sure the saddle and pedals are comfortable and that you don't lean too far forward. The ground you can cover daily depends on your physiological condition. But if you race, never drink alcohol in any form.

If you carry a load on your bicycle, its weight should permit you to cover at least an average of 3.1 miles an hour without undue effort.

FARM WORK

Are you a farmer? Or have you recently turned your back on the city to take up your countryside acre and garden? Then use a spade or shovel weighing $3\frac{3}{4}$ pounds and load it with not more than 20.55 pounds at most. Get a two-wheeled barrow holding a load of 220 pounds. If you are heavy, you can do more work with a wheelbarrow than if you are light.

SAWING

In using a double-handed saw operated by two men, you get your best results from regular and moderately speedy strokes at the rate of about 17 or 18 inches and 80 strokes per minute. Stooping is, of course, unavoidable.

HANDLING CORRESPONDENCE

Learn economy in handling correspondence. Here I commend to you Irving Fisher's practice which I reprint with his permission. Not long ago I wrote him to ask whether a suggested time and place would be convenient for an appointment. He returned my letter stamped thus

**Please excuse this informal method
of replying, made necessary by grow-
ing correspondence.**



with a "Yes. I. F." written in pencil to the left of my question.

SOME RULES FOR BUSINESS MEN

Allow work in process only to remain on top of the desk.

Place unfinished work in a drawer, preferably the top left-hand drawer.

Place finished work preferably in the bottom, right-hand drawer.

A desk blotter is usually necessary.

Place the scratchpad near the center of the desk blotter, away from the edge.

Never have your telephone on your desk. Keep it on a stand or special shelf, preferably at the left of your desk chair.

Keep no ash trays on the desk. Put them somewhere to the right of your chair.

Envelope opener, scissors, knife, hand blotter, etc., belong at the right side of the desk.

Keep inkwell filled. Place it at the back of the desk, near the center, when not in use.

Place necessary pencils and pens near inkwell.

If you use an "in and out" mailing system, place the two trays at the back, left-hand side of the desk.

Place books and papers on the left side of the desk.

Schedule all work. Live up to your schedule.

Allow a definite length of time for interviews. During these, forget all other activities.

Establish a regular time for daily luncheon periods.

Be systematic in all things.

Think constructively of ways and means to perform daily tasks better with less effort.

Develop good business methods in all things—from art to science.

Speak directly and to the point in as few words as possible. Do this, too, in writing.

Beware of the office that looks extremely busy. Most of the busyness is probably inefficiency. Lost motion distracts attention.

Learn to use both arms and hands. Never make one do all the work.

SOME RULES OF CONTROLLED POWER

Don't begin a task before laying out all implements.

Always think of the best methods of doing a job before you start it.

Avoid the common error of thinking of more than one job at a time.

As a rule, stop physical activities while planning the next task.

Avoid short, quick movements of the body and limbs.

Learn to accomplish the most with each simple movement.

Work to the objective of reducing all physical activities to simple movements.

During periods of work, rest periodically, as we have described, regardless of your sense of fatigue.

Place all implements so that you exert the least possible effort in reaching and replacing them.

Try to have most working points near the waist-level to avoid excessive body-bending.

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